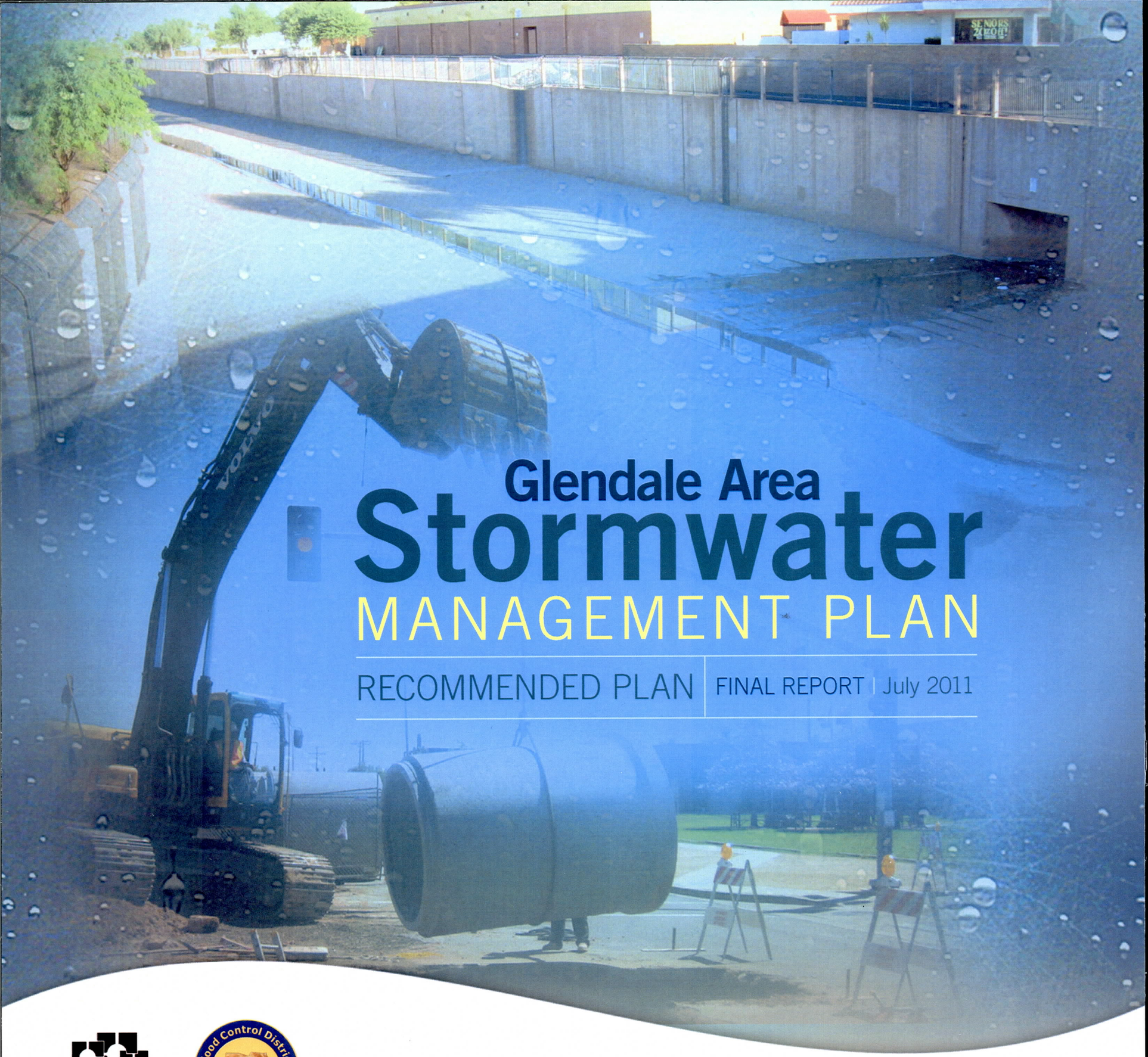

Glendale Area Stormwater MANAGEMENT PLAN

RECOMMENDED PLAN | FINAL REPORT | July 2011

GLENDALE AZ

Flood Control District of Maricopa County

Prepared for: City of Glendale and the Flood Control District of Maricopa County

Kimley-Horn and Associates, Inc.

Kimley-Horn and Associates, Inc.

GLENDALE AREA STORMWATER MANAGEMENT PLAN

RECOMMENDED STORMWATER MASTER PLAN

Prepared for:
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July 2011

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Registered Professional Engineer (Civil) CERTIFICATE 36852 DAVID E. JENSEN Date Signed 7/13/11 ARIZONA U.S.

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1.0 Introduction

1.1 Purpose

The Glendale Area Stormwater Management Plan (SMP) has been completed for the City of Glendale and the Flood Control District of Maricopa County (District). In 2009, the City identified the need to update the Glendale Area SMP just for the City of Glendale. The need for the update is due to the dramatic amount infrastructure and land uses changes that have taken place in recent years throughout the City. Many of the changes are due to converting land from agriculture to residential use, addition of drainage infrastructure, and the increased development of the commercial and industrial areas. This study identifies those flooding issues which exist within the City limits and develops concepts to mitigate that flooding.

An older Glendale SMP was completed in 1986, by the City of Glendale. This study developed a plan to mitigate flooding using a series of storm drain networks north and south of the ACDC on several of the major arterials and detention basins to convey stormwater flow to the ACDC, New River, and Agua Fria River. In 1987, the City of Glendale and Peoria along with the District completed the Glendale/Peoria Area Drainage Mater Plan (ADMP) in which concepts for several large outfall drains were developed and constructed that conveyed flow from both the City of Glendale and Peoria to the east to the New River. This study was updated in 2001 and 2008 for a portion of the watershed outside of the city of Glendale. In 1997, the Maryvale Area Drainage Master Study (ADMS) was completed for the Cities of Glendale and Phoenix along with the District. All of these studies developed difference drainage concepts and plans.

1.2 Scope of Project

The Glendale Area Stormwater Master Plan was conducted in two major phases. The first phase consisted of a completion of several baseline studies, which included the following tasks:

- Data Collection and Review
- Updated Storm Drainage System Description
- Hydrologic Study and Analysis
- Existing Drainage Issues/Problems Identification

The second phase of the project consisted of identifying and evaluating storm water drainage facility alternatives and recommending an alternative plan that is effective in managing storm water within the City. Items included in this phase were:

- Alternatives Formulation
- Alternatives Analysis
- Recommended Stormwater Master Plan

1.3 Authorization

The City of Glendale (City) and the contracted with Kimley-Horn and Associates (KHA) to develop an update to the existing Stormwater Management Plan that was completed in 1986. The project was initiated in June of 2009.

1.4 Contact Information

The City of Glendale and the Flood Control District of Maricopa County funded this study. The City of Glendale project number is 089017. The contact information for the project manager representing each agency is provided below.

City of Glendale
Wade B. Ansell, P.E., R.L.S.
5850 W. Glendale Avenue, Suite 315
Glendale, AZ 85301

Flood Control District of Maricopa County
Greg Jones, P.E.
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Phoenix, AZ 85009

Kimley-Horn and Associates, Inc.
David Jensen, P.E., CFM
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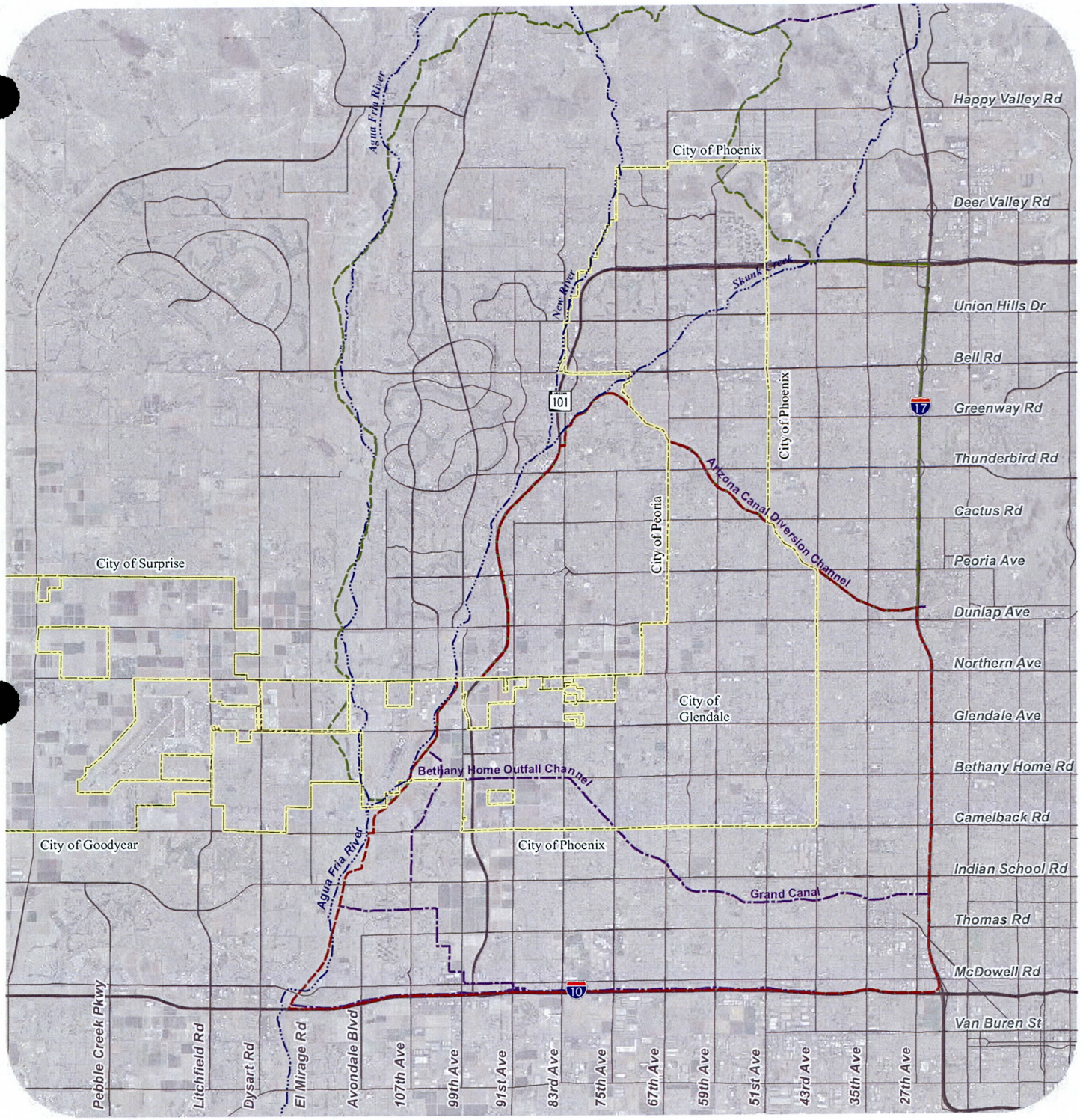
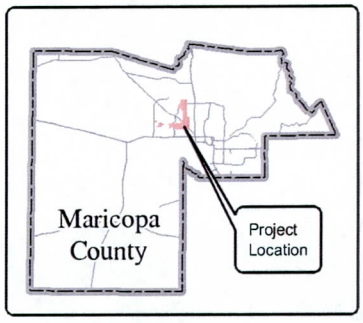
1.5 Location

The study area was City of Glendale city limits with the exception of those area west of the Agua Fria River. **Figure 1** is the vicinity map for the City of Glendale.

Figure 1. Project Vicinity Map





Legend

- City of Glendale (Planning Area Limits)
- Maryvale ADMS Watershed
- Glendale/Peoria ADMPU Watershed

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2.0 Approach and Methodology

The Glendale Area Stormwater Master Plan was conducted in two phases. The first phase included evaluating the existing conditions and the existing drainage facilities within the City. This involved data collection and review, field reconnaissance, an update of the hydrology for both the Maryvale ADMS and Glendale Peoria ADMPU watersheds, an inventory of the existing drainage facilities within the City and a capacity analysis of those facilities. The second phase entailed formulating and evaluating alternatives to mitigate drainage issues located in the project area and to present a develop a recommended stormwater master plan.

2.1 Existing Conditions Evaluation

KHA collected and reviewed data provided by the City and other agencies for use in the Stormwater Master Plan. This information came in the form of drainage reports, maps, exhibits, as-built plans, land use plans, aerial orthophotography and topography for the project area.

KHA conducted a field review of the arterial street intersections within the project limits. The field review consisted of documenting the drainage features observed at each intersection. Items that were noted included existing storm drains, direction of flow, and significant drainage features. The purpose for the field review was to assist with the flow concepts for the hydrology update and to identify the existing drainage issues.

The hydrology update was conducted as part of the existing conditions evaluation. The hydrology was updated for the existing Glendale/Peoria ADMPU and the Maryvale ADMS project areas. New development, land use changes, and NOAA 14 rainfall depths were incorporated into the hydrology update.

2.2 Stormwater Master Plan Development

Using the results from the existing conditions evaluation, the project team developed alternatives to mitigate the drainage issues identified. The formulation of alternatives was initiated with an Alternatives Formulation Workshop conducted in March of 2010.

Several of the alternatives were advanced to the next level of analysis while others were eliminated after evaluating the validity of each alternative. The alternatives that were advanced to the next level were analyzed and designed at conceptual level to develop opinions of probable cost. After conceptual design and preliminary cost estimates were developed the alternatives were evaluated using a common set of criteria. The team met again to review all of the alternatives, the scoring of the alternatives based on the criteria and select the recommended alternatives. The selected alternatives became the recommended master plan. Conceptual level plans were developed for the recommended master plan, the cost estimates were updated, and operation and maintenance guidelines were developed for the recommended plan.

3.0 Data Collection and Review

The data collected as part of the Stormwater Master plan was gathered from various sources. The majority of data was collected from the City of Glendale, the Flood Control District, ADOT, and the cities of Peoria and Phoenix. Most of the data that was received were GIS files and PDF files of existing facility as-builts, drainage reports, aerial orthophotography and topography. Once the information was received, the pertinent information was logged in a data inventory spreadsheet. KHA received data throughout the duration of the project. The data collection log is provided in **Appendix B**.

Previous reports and studies and investigations were reviewed for historical as well as hydrologic information. Particular attention was given to drainage issues and problems, hydrologic parameter development, and potential future drainage structures. The following section presents a brief summary of previous relevant investigations that were conducted within the project watersheds.

3.1 Previous and Adjacent Studies

Several reports and studies were received from the City of Glendale and the Flood Control District. They were screened for those that were pertinent to this project. The drainage reports relevant to this study are discussed in this section.

Glendale Stormwater Master Plan (1986). In 1986, the City of Glendale completed the Glendale Stormwater Master Plan. This plan included hydrologic analysis as well as several proposed alternatives to mitigate or eliminate flooding within the city. The recommended plan proposed a series of storm drains to be constructed wholly within the city with several retention/detention basins to reduce pipe sizes. A retention/detention criterion was established for future development within the City to help reduce the impact of development on the storm drain system. The results of the plan were to construct a storm drain system that could contain the 10-year frequency storm and proposed 100-year 2-hour retention/detention basins for future development.

Glendale/Peoria Area Drainage Master Plan (1987). In 1987, District and the City of Peoria joined the City of Glendale to prepare the Glendale/Peoria ADMP. This plan superseded the Glendale Stormwater Management Plan by proposing a series of storm drains through the City of Glendale and Peoria that would provide storm drain outfalls for the City of Glendale and reduced the number and size of storm drains that would be required within the City of Glendale. The update proposed construction of three major storm drain outfalls and a method of sharing costs of construction between the Cities of Glendale and Peoria and the District. The three outfalls were:

1. The Cactus Road Drain;
2. The Olive Avenue Drain
3. The Orangewood Drain.

The costs for the three outfalls were split between the three agencies; 25% for the Cities of Glendale and Peoria and 50% for the District.

The Olive Avenue Drain was the first facility constructed and was completed in several segments. Construction began in 1989 and was completed in 1992. The Cactus Road Drain was constructed in 1993. During the design of the Orangewood Drain, the Loop 101 was completed by ADOT at Glendale Avenue and provided an improved outlet for the Orangewood Drain. The alignment was modified to run the storm drain in Glendale Avenue from the Loop 101 to 83rd Avenue, north on 83rd Avenue to Orangewood, then east to approximately 65th Avenue. The plan was further modified to reduce the size of the basin at 71st Avenue and Orangewood and add a large basin at 63rd Avenue and Northern. This design reduced the pipe size under Grand Avenue and the railroad as well as providing additional floodwater storage capacity near Northern. ADOT, during their construction of the 59th Avenue underpass on Grand Avenue, constructed large diameter storm drains from 59th Avenue to the basin at 63rd Avenue and Northern.

Maryvale Area Drainage Master Study (1997). The Maryvale ADMS was conducted for the District and the Cities of Glendale, Phoenix, Tolleson, and Avondale to develop a hydrologic analysis and identify flooding issues within the Maryvale ADMS project area. The study area was from I-17 on the east, the Aqua Fria Freeway (Loop 101) on the west, the ACDC on the north and I-10 to the south.

Hydrology models were prepared for the 10-year, 6-hour; 100-year, 6-hour; and the 100-year, 24-hour storm events. Ponding areas were identified along Grand Avenue, the Grand Canal and the Roosevelt Irrigation District canal, as well as along 27th and 35th Avenues. The study also indicated that the I-10 drainage channel may not have capacity for the 100-year storm event near 83rd and 91st Avenues.

The Maryvale ADMS was first submitted in 1997 and incorporated the revisions to the Orangewood Drain and detention basins. This study further identified several drainage areas that were subject to flooding adjacent to the Grand Canal and Grand Avenue. Several options were analyzed to mitigate the flooding in these areas. Of the 10 areas studied, four were within the city of Glendale. The major recommended project from the Maryvale ADMS was the Bethany Home/Grand Canal Outfall Channel (BHOC), which benefitted both the Cities of Glendale and Phoenix. Segments of this system are still being constructed in 2011.

Bethany Home/Grand Canal Flood Control Project (September 2000). This study was conducted in response to flooding issues identified in the Maryvale ADMS. This pre-design study developed a concept for the BHOC between 97th Avenue and 73rd Avenue.

Glendale/Peoria Area Drainage Master Plan Update (May 2001). This Glendale/Peoria Area Drainage Master Plan Update (ADMPU) study was conducted for the District, the Cities of Glendale, Peoria and several other cities. The study updated ADMP area study hydrology and developed new flood control concepts. The study was updated for the purposes of developing a hydrology model to identify and quantify

flooding issues within the Glendale/Peoria ADMPU project area. A detailed study of the Arrowhead Lakes was included as part of the update.

The boundaries of the study area changes from the 1987 Glendale Peoria ADMP. The southern boundary of the study was the ACDC and the New River. The eastern boundary was I-17. The western boundary is the Agua Fria River. The major projects to be developed from this study within the City of Glendale included a channel on the northside of Pinnacle Peak Road and 67th Avenue intercepting flow into the City.

Glendale/Peoria ADMPU Northwest Region Update (May 2007). This study was conducted for the District to update the hydrology for the portion of the Glendale/Peoria ADMPU watershed north of Union Hills Road and west of New River. The purpose of the update was to incorporate new developments in the area into the hydrology model. The report was reviewed for subbasin delineations as well as flow paths and diversion data. This study area is outside the City of Glendale.

Determination of Mapping and Flood Zone Changes and Elevation Certifications Technical Data Notebook (September 2008). This report was prepared for the City of Glendale to analyze three floodplain locations along Grand Avenue and one location along the Grand Canal. It documents the changes that have taken place along Grand Avenue and the Grand Canal to alleviate flooding associated with ponding.

3.2 As-Built Plans

As-built plans for various structures were collected from several agencies, including Arizona Department of Transportation (ADOT), FCDMC, and the Cities of Glendale and Phoenix. Several records were received and reviewed from each agency. For simplicity, individual records that were reviewed are not listed here, but plans are divided and discussed generally by agency.

City of Glendale As-built and Design Plans. The Glendale as-built data consisted of several regional basins located within the City of Glendale and storm drain plans. The plans for the regional basins were used to calculate stage-storage-discharge curves. The design plans for the Northern Avenue storm drain, Bethany Home Road storm drain, 67th Avenue storm Drain and the Cactus Drain were obtained to include in the hydrology model along with the storm drain data received from the City of Glendale storm drain database.

ADOT As-built Plans. ADOT as-built plans were obtained to review the drainage structures along Loop 101, I-10 and Grand Avenue. The geometry and slope of the Loop 101 drainage channel was taken from these records. The plans for the I-10 drainage channel were reviewed to confirm the geometry used in the Maryvale ADMS. Stage-storage-discharge data was also calculated for several ADOT basins along Grand Avenue using the as-built grading plans.

District As-built Plans. These plans include the Bethany Home Outfall Channel plans and several storm drain plans, including the Northern/Orangewood storm drain, Camelback Road Storm Drain, the Olive Avenue Drain, and the Pinnacle Peak storm

drain. These plans contained storm drain and regional basin data that were input into the hydrology models.

City of Phoenix As-built Plans. These plans include grading plans for the Maryvale Ballpark, Sunset Basin, and Verde basin. Stage-storage-discharge data was calculated from this as-built data.

4.0 Update Existing Drainage System Description

The existing drainage facilities located within the City in the Drainage Facility Inventory Exhibit is provided in **Appendix A** and shown on **Exhibit 1**. The facility inventory report reviews the assumptions, methods and results of the facility inventory. The purpose of this facility inventory is to gather existing information from the GIS database recently created by the City and to update the inventory with storm drain construction projects since the GIS database was created. The facility inventory also included a hydraulic capacity analysis of the existing storm drain systems and storage capacity of existing basins.

4.1 Background

Prior to the 1986, storm runoff within the City was primarily contained in the streets or within the rural farm fields. Much of the area had flood irrigation that helped retain the storm water. Major water courses within the area were the New River, Aqua Fria River, and Skunk Creek. Some of the storm water drainage facilities were connected to the existing Salt River Project irrigation systems. In the mid-1980's, the ACDC was constructed which provided a major drainage outfall for storm events north of the Arizona Canal. Then the major storm drains started to be constructed.

Prior to the adoption of the Glendale/Peoria ADMP, there was no retention/detention ordinance to limit runoff from development such that increased runoff was also conveyed within the streets creating flooding in the area. Since the ADMP, 100-year, 2-hour retention/detention criteria has been established for all developments to help mitigate flooding.

4.2 Assumptions

This drainage facility inventory identified, named and located all existing significant or major drainage structures in the study area including storm drains over 24-inches in diameter, 100-year retention and detention basins, canals, any natural channel and washes. Storm drains under 24-inches and all private storm drain systems were not reviewed or analyzed. All storm drain systems that have been constructed since the GIS database was created were placed in a revised GIS database. The data was collected from current design plans and completed as-builts from the city of Glendale.

4.3 Methods

A normal flow depth analysis of the data for the facility inventory was completed for the storm drain facilities to determine hydraulic capacity. The manning's equation was used to find full flow capacities of the existing storm drain systems. The manning's equation uses the diameter, slope, and material roughness to determine the capacity of the existing pipe.

All other information was collected from the city of Glendale, including construction plans and drainage reports for storm drain systems constructed between the completed GIS database and the completion of any storm drain construction projects.

4.4 Existing and Future Drainage Facilities

Exhibit 1 shows the existing drainage facilities within the city limits. The existing major drainage systems include:

- Loop 101 and I-10 Drainage Systems
- Olive Avenue Drainage System
- Cactus Drainage System
- Orangewood Drainage System
- Bethany Home Road/Grand Canal Drainage System (BHOC)
- Arizona Canal Diversion Channel
- Skunk Creek/Scatter Wash Channelization
- Northern Avenue Storm Drain system, which discharges into Orangewood System
- Camelback Road Drainage System, which discharges into the BHOC

Major improvements of the Orangewood, Cactus, Olive and Butler Drains included construction of regional detention basins. Construction, based on the original and modified ADMPs included the Cactus Drain, Olive Drain, Bethany Home Outfall Channel and others. Several retention basins have been constructed in anticipation of future storm drain projects providing outfalls.

Loop 101 and I-10 Drainage System - As part of the ADOT State Route Loop 101 freeway system, a series of drainage channels were constructed which intercept various drainage basins, collects the runoff and conveys it to the New River and the Aqua Fria River. Construction of I-10 also provided drainage channels to convey the water intercepted by the freeway. A capacity analysis was not completed on the Loop 101 or I-10 Drainage Systems.

Olive Avenue Drainage System - In 1990, the Olive Avenue Drain was constructed from the Loop 101 drainage channel to 67th Avenue. Three different extension projects have since been built extending the storm drain to 47th Avenue. Since construction of the Olive Avenue Drain, extensions north in 67th Avenue have been constructed to north to Cactus Road. Another storm drain was constructed in 59th Avenue between Olive and Brown in 2008. The system discharges into the Loop 101 drainage system.

Cactus Drainage System - In 1996, a storm drain was constructed in three phases through the city of Peoria in the Cactus Road alignment between the Loop 101 drainage channel and 67th Avenue. In 2008 and 2009, the storm drain was completed between Cactus Road and the ACDC. The system discharges into the Loop 101 drainage system.

Orangewood Drainage System - The Orangewood Drain was constructed in two phases and sub-phases from 1998-2001. The alignment for this drain was modified due to construction of the Loop 101 drainage channel. The Orangewood Drain discharges into the Loop 101 Drainage System. Between Loop 101 drainage channel and 83rd Avenue, the alignment is within Glendale Avenue. At 83rd Avenue, the storm drain is constructed in 83rd Avenue to Orangewood and then east to the 65th Avenue alignment. The storm drain then runs north, under the Grand Avenue to a regional detention basin at 63rd and Northern. A second basin was constructed at 71st Avenue. An extension of this storm drain is currently under construction between 63rd and 47th Avenues.

Bethany Home Road / Grand Canal Drainage System - Construction on the Bethany Home Outfall Channel (BHOC) began in 2000 which consisted of a large open channel to contain the 100-year storm event between 83rd and the Loop 101 drainage channel. A large concrete box culvert and pipe system conveys the flow from 75th Avenue to 83rd Avenue. The system consists of a rectangular open channel and large basin/channel system between 67th Avenue and 75th Avenue. The outfall channel has recently been extended further east, through the City of Phoenix to the Sunset Basin east of 67th Avenue by a large diameter pipe that connects the Sunset Detention Basin within the City of Phoenix to the rest of the BHOC.

A future extension is planned along Bethany Home Road between 59th and 79th Avenue, which will provide protection against storms for the center portion of Glendale. A capacity analysis was not completed on the BHOC.

Camelback Road Drainage System – The Camelback storm drain was completed in 2011. It is a large diameter storm drain that begins east of 59th Avenue and discharges into the BHOC east of 75th Avenue. The storm drain discharges into the BHOC.

Arizona Canal Diversion Channel (ACDC) - The portion of the ACDC was completed through Glendale in the late 1980's which has provided a major outfall for several north south drainage systems within the City. These drains include one in 67th and 59th Avenues from the ACDC to Bell Road. The ACDC discharges into the New River. A capacity analysis was not completed on the ACDC.

Skunk Creek - In 1999, Skunk Creek was improved between 51st Avenue and the ACDC. Improvements included additional channelization to improve capacity and bank protection to stabilize the slopes and invert of the channel. Flow in Skunk Creek is controlled by the Adobe Dam but Scatter Wash remains uncontrolled. A capacity analysis was not completed on Skunk Creek or Scatter Wash.

Northern Avenue Storm Drain System – The Northern Avenue Drainage system is a large diameter storm drain that was constructed in 2010. The system begins at 47th Avenue and discharges into a large regional detention basin at 63rd Avenue. The detention basin discharges into the Orangewood Storm Drain system.

4.5 Hydraulic Capacity Analysis

A hydraulic capacity analysis was completed for all of the storm drain systems within the City of Glendale with the exception of the BHOC System, ACDC, and Scatter Wash/Skunk Creek systems. The hydraulic capacity analysis assumed that all pipes are flowing full. For calculations purposes, if no slope was present in the existing facility inventory, the existing ground slope was used as the pipe slope. The storage capacity of each catch basin is also identified. **Appendix C** shows a summary of the capacity analysis.

5.0 Hydrology Analysis and Update

KHA prepared existing and future conditions models to update the existing Maryvale ADMS and Glendale/Peoria ADMPU studies. Separate HEC-1 rainfall runoff models were prepared for each area. The HEC-1 hydrology models were updated based upon land use changes, NOAA 14 precipitation data, and drainage facilities that have been constructed since the previous studies were completed. The main objectives of the hydrology update included:

- Evaluating the 10-year and 100-year, 6-hour and 24-hour storm events for the existing and future conditions
- Evaluate the existing storm drain systems located within the City of Glendale
- Provide the tools for formulating and analyzing alternatives to relieve flooding areas within the City of Glendale

A detailed explanation of how the hydrology models were completed is documented in the *Glendale Area Stormwater Management Plan: Hydrology Report* (February 2011) completed by KHA as part of this Stormwater Master Plan. A summary of the results from the hydrology models are located in **Appendix D**. Included with the results are the Existing and Future Conditions HEC-1 Schematic Exhibits, the Subbasin Delineation Map, and the 10-Year and 100-Year Storm Event Discharge Exhibits.

5.1 General Description

Maryvale ADMS

The Maryvale ADMS study area encompasses portions of the Cities of Glendale, Phoenix, Peoria, Avondale and Tolleson as well as portions of unincorporated Maricopa County. The study area is bound by the Arizona Canal Diversion Channel (ACDC) and Skunk Creek on the north, Interstate 17 (I-17) on the east, Interstate 10 (I-10) on the south and Loop 101, New River, and Agua Fria River on the west. **Exhibit 2** is the vicinity map for the Maryvale ADMS.

The land in the Maryvale ADMS watershed generally slopes from northeast to southwest at a slope of approximately 0.4 percent. Surface water drainage is primarily conveyed south and west in the streets. One major exception to this is along Grand Avenue, which transects the watershed on a diagonal. Grand Avenue parallels the BNSF Railroad alignment and is typically a barrier to flow. The Grand Canal, which crosses the Maryvale ADMS watershed, also acts as a significant flow barrier.

Skunk Creek and the ACDC are located along the northern boundary of the Maryvale ADMS watershed. The 100-year storm runoff coming from the north will be intercepted by these drainage facilities and conveyed west to New River. The eastern watershed boundary is the I-17 freeway which acts as a drainage barrier for flow coming from the east.

Three regional channels convey flow across the watershed. The I-10 drainage channel intercepts stormwater north of I-10 and conveys flow west to Agua Fria River. The Loop 101 drainage channel is located east of Loop 101 and conveys flow south and west underneath the freeway at several locations to New River and Agua Fria River. BHOC alleviates flooding north of the Grand Canal and conveys flow from 67th Avenue to the New River.

Several regional storm drains also convey flow either south to the I-10 drainage channel or west to New River. Storm drains in the Cities of Glendale and Peoria are described in the Section 4 as part of the Glendale SMP and consist of the Cactus Drainage System, the Olive Avenue Drainage System, the Orangewood Drainage System and the Bethany Home Road/Grand Canal Drainage System. These storm drains all convey flow west to New River. City of Phoenix storm drains are located in each north/south mile and half-mile street between I-17 and 43rd Avenue and in each north/south mile street between 43rd Avenue and 91st Avenue. The City of Phoenix storm drains convey flow south to the I-10 drainage channel.

One storm drain was under construction and two were being designed at the time this hydrology report was prepared. The Northern Avenue storm drain is currently under construction and was included as part of the existing conditions model. The Bethany Home storm drain from 71st Avenue to 79th Avenue and the Camelback Road storm drain from 59th Avenue to BHOC are being designed and were included in the future conditions analysis.

Several regional detention/retention basins are located in the Maryvale ADMS watershed. Some of these basins act as surge basins for the storm drains and others are located along the upstream end of Grand Avenue or at other locations to help alleviate ponding.

Glendale/Peoria ADMPU

The terrain in the Glendale/Peoria ADMPU watershed is characterized by steep hills draining to milder slopes in the area north of Pinnacle Peak Road. In this northern area there are several natural channels that have not been significantly altered by development. South of Pinnacle Peak Road the land generally slopes to the south and drains to the ACDC, New River or Agua Fria River through man-made channels.

The ACDC, Skunk Creek, New River and Agua Fria River are all downstream boundaries of this model. Flows conveyed in these channels from areas upstream of the Glendale/Peoria ADMPU watershed have not been modeled. It is not the intention of this report to model the flows in any of these drainage facilities.

There are relatively few existing storm drains in the Glendale/Peoria ADMPU watershed. In the Cities of Glendale and Phoenix, storm drains convey flow south to the ACDC. The City of Phoenix also has a storm drain in Union Hills Drive that conveys flow west to Skunk Creek. Two storm drain systems were identified in the City of Peoria. The Pinnacle Peak storm drain located between 91st Avenue and 83rd Avenue conveys flow east and south to a channel at Williams and 83rd Avenue. There is also a drainage system in Union Hills and Bell Road which conveys flow from 91st Avenue east to New River.

Regional detention/retention basins located within the Glendale/Peoria ADMPU watershed help to attenuate flow. These regional basins consist of the Arrowhead Lakes and surge basins associated with storm drains. Although the Arrowhead Lakes are associated with a development, they are considered regional basins because they retain more than the required 100-year, 2-hour storm volume.

5.2 General Model Description

Maryvale ADMS

The runoff generated in a subbasin under natural (undeveloped) conditions typically converges to a single point. However, due to the nature of urban hydrology, where stormwater is conveyed along a network of streets, runoff may leave the subbasin at any point along the subbasin boundary through street flow. Typically, in the Maryvale ADMS study area the concentration point is represented by the south and west subbasin boundaries.

In general, the flow generated in a subbasin is combined with the surface flow routed from the north and the west. This combined surface flow is combined with the upstream storm drain flow. From the combined surface water and storm drain flow, the capacity of the storm drain is diverted and routed separately. The remaining surface flow is diverted either south or west and combined with flow generated in the downstream subbasin. A typical schematic of the routing and diversions associated with one subbasin is shown in **Figure 2**.

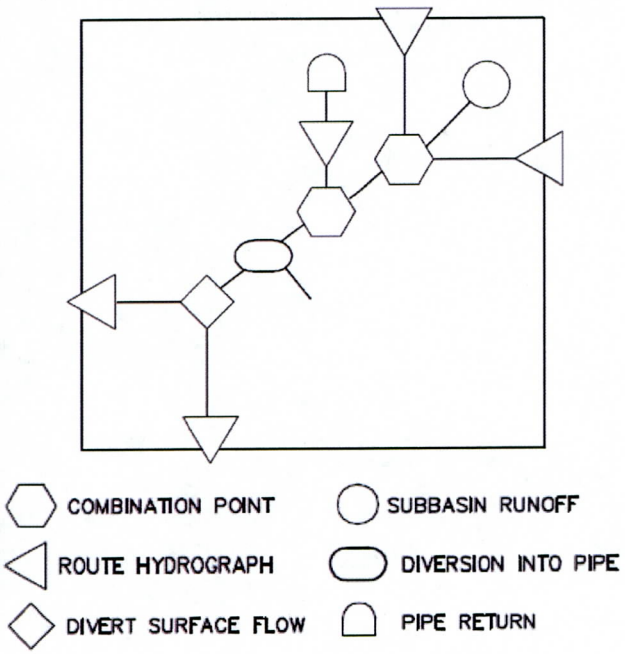

Figure 2. Typical Maryvale ADMS Watershed Subbasin Schematic

Glendale/Peoria ADMPU

The portion of the Glendale/Peoria ADMPU project area south of Skunk Creek is typically urban with stormwater conveyed along a network of streets. In these urban areas the model is arranged similar to the Maryvale ADMS study area as shown in **Figure 1**.

The remainder of the Glendale/Peoria ADMPU project area conveys stormwater in a combination of channels and streets that act as channels. In this area the flow from one subbasin is typically routed downstream in one direction.

5.3 Subbasin Delineation

Maryvale ADMS

Subbasin boundaries within the Maryvale ADMS project area are typically defined by the mile streets. The area of each subbasin in this area is approximately one square mile. The total area included in the Maryvale ADMS watershed is 96 square miles for a total of 148 subbasins. These areas are approximately the same as those delineated in the 1997 Maryvale ADMS.

Glendale/Peoria ADMPU

To keep the Glendale/Peoria ADMPU hydrology model consistent with the Maryvale ADMS hydrology model, where possible, subbasins were delineated to create approximate one square mile areas. Some subbasins were further subdivided due to

topography. Subbasin delineations were based on major streets, topography, and 2009 aerial orthophotography obtained from FCDMC. The subbasin delineations were also compared with the Glendale/Peoria ADMPU and Northwest Region Update subbasin delineations. The subbasin boundaries of all three models are similar, although the subbasins delineated in this hydrology update are typically larger and encompass multiple subbasins from the previous studies. The total area included in the Glendale/Peoria ADMPU watershed is approximately 100 square miles with a total of 158 subbasins.

5.4 Land Use

Land use was obtained from the City of Glendale and the City of Phoenix General Plan GIS shapefiles. Maricopa Association of Governments (MAG) 2007 general plan and future land use shapefiles were obtained from the FCDMC and used in areas outside of these municipalities.

Existing and future conditions land use files obtained from municipalities and MAG were reviewed with 2009 orthophotography obtained from the District. Revisions were made to the existing land use data for discrepancies with areas larger than 160 acres. It is assumed that in the future, all currently empty lots will be built out according to the future conditions land use.

5.5 Retention

Retention was modeled by diverting 80% of the 100-year, 2-hour volume out of the model for areas constructed after 1990 when the retention requirement was adopted by the City of Glendale. The procedure for calculating volume, as outlined in the DDM, requires a runoff coefficient (C), rainfall depth, and drainage area. It was assumed that the retention was 80% of the design capacity. Runoff coefficients for MAG land use classifications are provided in Table 6.3 of the *Maricopa County Drainage Policies and Standards Manual*. These values were reviewed and applied to the land use classifications in this study.

The rainfall depths for the existing conditions retention calculations were obtained from the NOAA Atlas 2 isopluvial map in the DDM. NOAA Atlas 2 was the required source for rainfall depths when the existing retention basins were designed. The rainfall depths for the future conditions models were obtained from the NOAA 14 data in DDMSW. It is presumed that future retention basins will be developed based on NOAA 14. Drainage areas are based on land use type and apply only to developed areas. Several developed areas were excluded from the retention calculations and are explained in further detail below.

Areas developed after 1990 were required to retain the 100-year, 2-hour volume on-site. However, there are several developments built prior to 1990 in the project area that did not need to meet these requirements. Because of this discrepancy in retention requirements, developed areas were divided into pre-1990 and post-1990 areas. Areas developed prior to 1990 were not modeled with retention. Both watersheds include areas

that were developed after 1990, and retention is provided in the hydrology models based on the 100-year, 2-hour requirement.

It is common for developments located along a major watercourse to be waived from meeting the 100-year, 2-hour retention requirement, provided that post-development discharges do not exceed pre-development levels and that first flush requirements are met. It was assumed that developments located along Agua Fria River, New River, Skunk Creek, Bethany Home Outfall Channel and the ACDC did not retain the full 100-year, 2-hour volume. Retention is also not required for individual residential parcels greater than one acre in area. Retention was not modeled for these developments.

Additionally, the Arrowhead Lakes, located north of Loop 101 and east of 75th Avenue are modeled as regional basins. Because the retention was modeled with storage routing, additional retention was not modeled for the developments that drain to the Arrowhead Lakes. The pre- and post 1990 developments were identified in the hydrology study and where retention will be required in the future.

5.6 Storage Routing

The HEC-1 level-pool storage routing routine was used to route through regional detention basins as well as ponding areas along significant drainage barriers. Regional detention basins were defined as surge basins used in conjunction with storm drains or basins that retain more than local subdivision drainage. Local subdivision retention is accounted for in the model and is described in further detail in **Section 5.5**

5.7 Diversions

Two primary types of diversions were utilized in the study: storm drain diversions and surface flow diversions. Several methods were used to determine the surface flow diversions, including multiple street diversions, single street intersection diversions, parallel street diversions, topographic diversions, and channel capacity diversions. The storm drain, multiple street, and parallel street diversion methods are explained in greater detail below.

5.7.1 Storm Drain Diversions

The storm drain diversions divert the full flow capacity of the storm drain away from the surface flow. Full flow capacities were estimated based on the slope and the diameter of the pipe. Slopes and diameters were determined from the GIS storm drain databases received from the Cities of Glendale, Phoenix, and Peoria.

Storm drain flow was accounted for at each subbasin located adjacent to a storm drain system with a diameter of 24 inches or greater. Storm drains completely contained within a subbasin were not modeled. After each subbasin hydrograph, the full flow capacity of the pipe was diverted into the storm drain. To better facilitate tracking flow in the storm drain, it was retrieved after each combination point. The storm drain retrieval was combined with the surface flow at the next downstream point and then the full flow capacity of the pipe was diverted back into the storm drain at that location.

5.7.2 Multiple Street Diversions

Multiple street diversions occur in urban areas where the streets act as conveyance channels. In these urban areas water may split off from the main flow at several locations along the subbasin boundary. This flow pattern is typical for most of the Maryvale ADMS watershed and the portion of the Glendale/Peoria ADMPU watershed north of the ACDC and east of Skunk Creek.

These diversions take place after a subbasin combination to estimate how much of the runoff will flow south and how much will flow west for each one-square mile area. The diversion is a constant ratio based on normal depth calculations using Manning's equation. The ratio is based on the composite widths and the slope of the north/south streets compared to the composite widths and the slope of the east/west streets.

Each street was categorized as either arterial, collector, or local. For the purposes of this study, the mile streets are designated as arterials, the half-mile streets as collectors, and all other streets are local streets. For areas within the City of Glendale, typical street sections were based on the City of Glendale typical streets sections. For all areas outside of the City of Glendale limits, typical street sections were created based on an average geometry of typical street sections from the City of Phoenix and the City of Peoria.

5.7.3 Parallel Street Diversions

Maryvale ADMS

The parallel street diversion always occurs after a multiple street diversion in the Maryvale ADMS watershed. The multiple street diversion splits the flow to the south and west. The parallel street diversion estimates how much of the flow in one direction will be directed down the arterial street and how much will be directed down the collector and local streets. This occurs near Grand Avenue because the arterial street directs the flow to a different subbasin than the collector and local streets. This split is shown below in **Figure 3**.

The diversion is a constant ratio based on the width of the arterial street compared to the composite width of the local and collector streets. It is assumed that the slope of the collector and local streets are similar to the slope of the arterial street and, so the effect of the slope will be negligible.

Similar to multiple street diversions, the streets utilized in these diversion calculations were categorized as arterial, collector, or local.

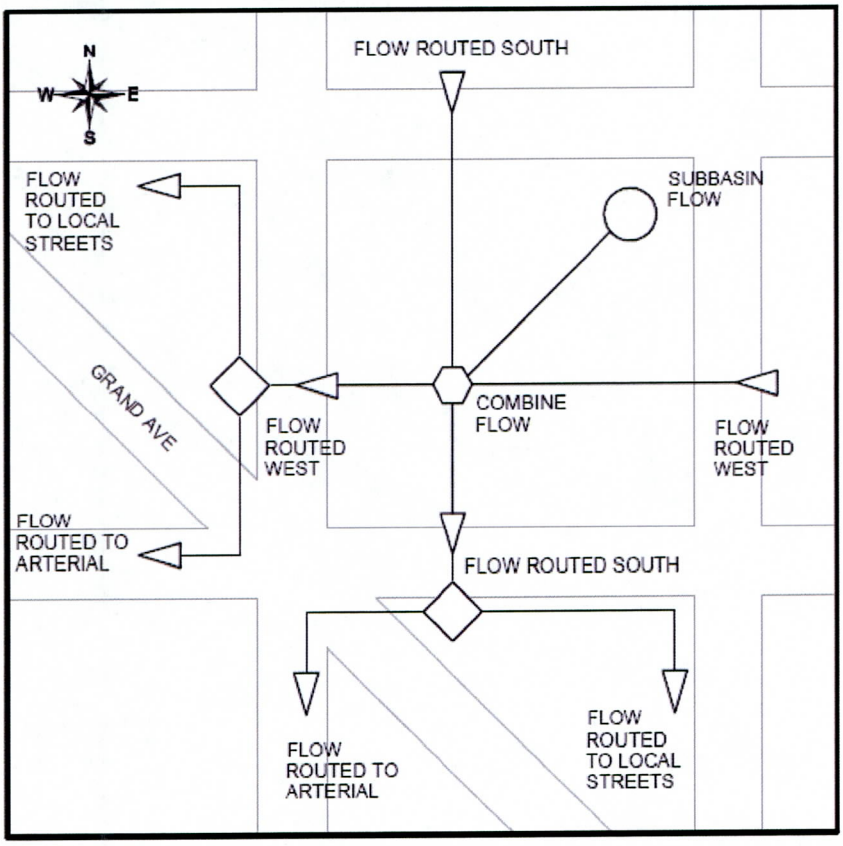

Figure 3. Typical Parallel Street Diversion within the Maryvale ADMS Watershed.

Glendale/Peoria ADMPU

The parallel street diversions within the Glendale/Peoria ADMPU watershed are similar to the parallel street diversions that occur within the Maryvale ADMS watershed, except that this diversion may be between two single streets or a composite of parallel streets. This split is shown below in **Figure 4**. The diversion is a constant ratio based on the composite width of the streets in one subbasin compared to the composite width of the streets in the other subbasin. Slope is not included in the ratio because it is assumed that the difference in slope is negligible.

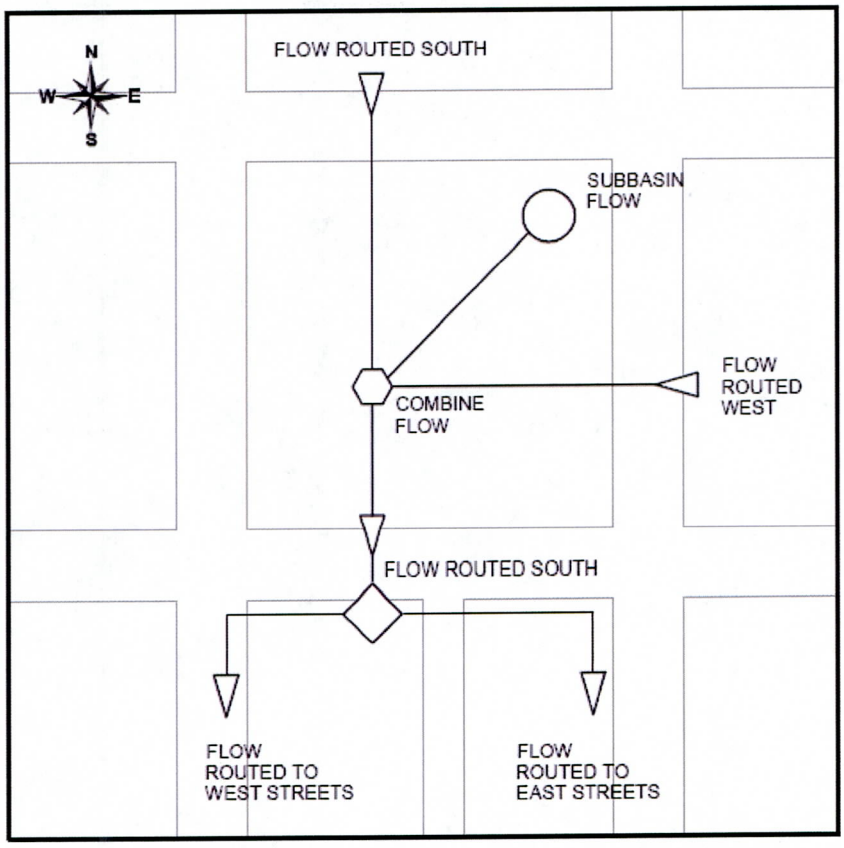

Figure 4. Typical Parallel Street Diversion within the Glendale/Peoria ADMPU Watershed.

5.8 Comparisons with Previous Studies

Maryvale ADMS

The 100-year peak discharge generated in each subbasin was compared with the corresponding subbasins in the Maryvale ADMS. Overall, the peak discharges from the model are, on the average, approximately 20% lower than the previous study. This decrease was anticipated due to the change from NOAA Atlas 2 to NOAA 14 rainfall depths. Although other changes between the previous and current study, such as land use, may have impacted localized changes in the hydrology results, the major factor in such a broad-based decrease in flows is most likely due to the change in rainfall.

Glendale/Peoria ADMPU

The 100-year peak discharge generated in each subbasin was compared with the corresponding subbasins in the Glendale/Peoria ADMPU and the Northwest Region Update. In order to make the comparison on a subbasin basis, the peak flow from several subbasins in the previous studies were combined and compared to a comparable subbasin in the model. Overall, the peak discharges from the model are approximately 30% lower than the previous studies. Similar to the Maryvale ADMS study area, this decrease was expected due to the change in rainfall depths.

5.9 Conclusions

The purpose of the hydrology investigation was to update the hydrology for existing and future conditions in the Maryvale ADMS and Glendale/Peoria ADMPU study areas. The results of the hydrology study were used to develop the recommended Stormwater Management Plan to manage existing and potential flooding problems within the City of Glendale. The hydrology models provide a basis for the subsequent detailed examination of various site specific drainage improvements.

5.10 Hydrology With Proposed Drainage Projects in Place

Rainfall runoff models were also developed for future conditions with the recommended projects in place. The results of this analysis are in **Appendix C**.

6.0 Identification of Existing Flooding Issues

6.1 Flooding Data Sources

The identification of existing flooding issues was developed in several ways. They include:

1. Referring to the database of flooding complaints developed by the City of Glendale.
2. Input from City personnel.
3. Review of the hydrology analysis where the results showed large peak discharges with no stormwater conveyance facilities
4. A review of the topography that could indicate ponding locations.
5. Review of historic flooding data from the City and District.

The location of each flooding issue is shown on **Exhibit 1** in **Appendix A.**

6.1.1 Database of flooding complaints

Drainage complaints were obtained from a City database dating from 1988 to 1998. The complaints were filtered to remove the complaints that have previously been resolved.

6.1.2 Input from City Personnel

The areas of flooding within the City of Glendale were identified by City employees from past experiences. Input from City personnel was mostly from the engineering department and some informal input from maintenance personnel.

6.1.3 Review of hydrologic analysis

Areas of flooding were also identified using the results of the hydrology modeling conducted for this study by reviewing all areas where 100-year peak discharge exceeds 600 cfs. This threshold value of 600 cfs is three times the approximate capacity of the smallest typical City arterial. It was determined that the capacity of the arterial streets is approximately 200 cfs. An average street slope of 0.003 ft/ft was used and it was assumed that the depth of flow in the street would be one foot in a 100-year event. This assumes that the arterial street conveys approximately one-third of the flow through a subbasin.

6.1.4 Topography review

The topography along major arterials was also examined for low or flat areas that may cause ponding to occur. These locations were screened and additional areas were

identified for regional and local drainage issues. Several of the low areas correspond with drainage issues already identified.

6.1.5 Review of historic flooding data

The flooding database at the District was researched. Data from several historic flood records were reviewed and the location of flooding was identified and added to the flooding issues.

6.2 Results for Regional Flooding Issues

6.2.1 Between Union Hills and the ACDC from 51st to 59th Avenue

The hydrology results indicate flows greater than 600 cfs along 51st Avenue from Thunderbird Road to Bell Road during the 100-year storm event. These flows are entering from the City of Phoenix. Currently, there is a City of Phoenix owned storm drain located in 51st Avenue from the ACDC to Union Hills Drive. According to the results from the hydrology analysis, the 10-year peak discharge along 51st Avenue from Union Hills to the ACDC is approximately 400 cfs.

6.2.2 ACDC access at Thunderbird and 59th Avenue

In 1989, a storm drain was constructed in 59th Avenue to contain the 10-year rainfall event north of Thunderbird Road. Stormwater runoff in excess of the 10-year event exceeds the capacity of the storm drain and ponds within 59th Avenue north of the bridge crossing and just south of Thunderbird Road. Ponding in this area can cause access to the hospital and other medical facilities in the area to be difficult and dangerous.

The original flow path for the inlet into the ACDC was blocked when a building was constructed on an elevated pad between the ACDC and 59th Avenue along Thunderbird Road. Excess flows are currently conveyed across the Sunset Gardens nursery to the ACDC. There is an existing spillway on the south side of the parking area. Recently, the nursery has closed. Future development of the nursery property could prevent the 100-year flow from reaching the ACDC.

6.2.3 67th Ave between existing orchard and Arrowhead Hospital (north of Union Hills)

Flooding occurs at the intersection of 67th Avenue and Sack Drive creating access problems into the Arrowhead Hospital. Flooding also occurs in the citrus field northeast of the Sack Drive and 67th Avenue intersection. Water ponds and backs into the street causing major street degradation and access problems into the hospital and other medical facilities.

6.2.4 51st Avenue North of Olive Avenue

City personnel indicated that there is flooding along 51st Avenue north of Olive Avenue during moderate storm events. Significant ponding occurs at the intersections. Flooding

occurs along 51st Avenue because the subdivisions to the east of 51st Avenue between Olive Avenue and the ACDC accumulate water which flows to 51st Avenue. The storm water exceeds the capacity of the street creating flooding along most of its length. City personnel also indicate flooding issues 51st Avenue and Peoria Avenue.

6.2.5 51st Avenue between Northern and Olive

As with the area north of Olive, this segment of 51st Avenue also experiences flooding during moderate storm events for many of the same reasons. Off-site flow from the east flows off individual lots and eventually flows toward 51st Avenue.

6.2.6 55th Avenue between Northern and Olive

Prior to construction of the Olive Avenue storm drain, major flooding used to occur on 55th Avenue. Flooding south of Butler could get over 18 inches deep and flow into the adjacent neighborhoods. Construction of the Olive Avenue drain has reduced the amount of stormwater runoff that gets to 55th Avenue and future alternatives along 51st Avenue will further reduce the occurrence of flooding in this area.

6.2.7 59th Avenue between Northern and Olive

59th Avenue is a major arterial located in the city of Glendale. The portion of 59th Avenue located between Northern Avenue and Olive Avenue is the only arterial located in the area without any stormwater conveyance or storage facilities. The street section does not have the capacity to convey the 10-year flow.

6.2.8 Maryland Lakes and Rose Lane Park

The Maryland Lakes and Rose Lane Park detention basins are located northeast of the Bethany Home Road and 51st Avenue intersection. The Maryland Lakes basin discharges to the Rose Lane Park basin through a 15-inch storm drain in Marlette Avenue. There is no outfall for the Rose Lane Park basin. These detention basins are undersized and flooded during most rain storms making the park facilities within the basins unusable several times during the year. Under the Maryvale ADMS, these basins are to be connected to the future Bethany Home storm drain.

6.2.9 Glendale Avenue between 51st and 59th Avenue

Glendale Avenue is an arterial street which has experienced flooding for several years. The primary issue is that the storm drain in Glendale is undersized for the major flows that occur on arterial streets. The undersized storm drain and lack of elevation to the finished floors mean the street cannot convey anything other than minor storm events.

When ADOT constructed the underpass under 59th and Grand Avenues, a storm drain was constructed in 59th Avenue from Glendale Avenue to Palmaire Avenue, thence to Grand and the basin at 63rd and Northern Avenues. A stub out was installed in Glendale Avenue to the east.

6.2.10 59th Avenue between Camelback Road and Bethany Home Road

59th Avenue is a major arterial located within the city of Glendale. Runoff from the local streets east of 59th Avenue causes the arterial to flood. The 59th Avenue street section does not have the capacity to runoff from even minor storms. A storm drain is currently being constructed in Camelback Road with a 72-inch diameter stub-out in 59th Avenue. The stub-out will extend north by approximately 1,200 feet.

6.2.11 67th Avenue between Camelback Road and Bethany Home

67th Avenue is a major arterial located within the city of Glendale. Runoff from the local streets east of 67th Avenue causes the arterial to flood. The 67th Avenue street section does not have the capacity to runoff from even minor storms. Design plans from the Glendale GO project at 67th Avenue shows that the catch basins are connected to the SRP tailwater system. A storm drain is currently being constructed in Camelback Road with a 72-inch diameter stub-out in 67th Avenue and will extend north into 67th Avenue for approximately 1,400 feet.

6.2.12 71st Avenue north of Camelback

71st Avenue between Camelback Road and Missouri Road is a heavily populated area with current storm water runoff protection. The Camelback Road storm drain is currently being constructed. There will be a 48-inch diameter stub-out at 71st Avenue.

6.2.13 Camelback Road and 91st Avenue

Currently the intersection of 91st Avenue and Camelback Road is a potential flooding location. The flows from the northeast pond at the intersection of 91st Avenue and Camelback Road. An existing 48-inch storm drain in Camelback Road extends west from the Loop 101 drainage channel to 95th Avenue.

6.2.14 Drainage of Major Arterials

The arterial streets provide the majority of traffic conveyance within the city. Storm drains in each arterial street would prevent flooding delays during storm events for the traveling public and emergency responders. Storm drains would also mitigate nuisance flooding for the citizens of Glendale and provide outfalls for runoff that flows from private property into the public right-of-way. Drainage facilities in the arterial streets will reduce flooding.

6.2.15 Drainage of Collector (Half-mile) Streets

Although the arterial streets convey the majority of traffic within the city, collector streets are the links between the residential and business areas to the arterials. Storm drains in collector streets will reduce local and some regional flooding and improve traffic access for the traveling public and emergency responders.

6.2.16 Bethany Home Road and 83rd Avenue (future library site)

The intersection of 83rd Avenue and Bethany Home Road experiences flooding at the Grand Canal, with flows coming from the northeast and flowing toward the intersection. BHOC is located to the south of the Grand Canal in this location and stormwater runoff is blocked from the BHOC by the Grand Canal. There are currently plans for a new City of Glendale library at the intersection of Bethany Home Road and 83rd Avenue.

Approximately 800 feet west of the intersection is a large grated drop inlet for two 54-inch pipes. The 54-inch pipes tie into three 10-foot by 10-foot box culverts conveying stormwater under the Grand Canal to the BHOC.

This flooding location has been eliminated from consideration because it is already part of the City of Glendale improvement plan. The future library site is being designed with storage capacity to contain runoff. The volumes generated by the 10- and 100-year storm events are 39 and 204 acre-feet, respectively. These volumes will be utilized in the final design of the library site and additional runoff will be directed to the 54-inch diameter pipe. No further analysis is required for the Glendale Area Stormwater Management Plan.

6.2.17 Floodplain at Northern and 67th Avenue

A 100-year FEMA Zone AO floodplain is located north of Grand Avenue and southeast of the intersection at Northern and 67th Avenues. This floodplain is adjacent to a regional detention basin at 63rd and Northern with a capacity of approximately 378 ac-ft. North and east of the floodplain there are two 60-inch storm drains which discharge to the regional basin.

New floodplain boundaries along Grand Avenue from 43rd Avenue to 67th Avenue were developed in September 2008 using NOAA Atlas 14 precipitation data using new 1-foot contour data was obtained for the regional basins in the project area. Additional 10-ft topography was provided by the City of Glendale and the Flood Control District of Maricopa County for the entire project area. Commercial properties are still located in the regulatory floodplain.

This flooding location has been eliminated from consideration due to the future construction of the Northern Parkway flyover, which will change the drainage patterns in the area. A drainage system will be included in the Northern Parkway design and effectively eliminate this floodplain.

6.2.18 Floodplain at North of Northern and West of 67th Avenue

A 100-year FEMA Zone AO floodplain is located north of Grand Avenue and northwest of the intersection at Northern and 67th Avenues. Several commercial properties are located in this floodplain.

Based on a lower runoff volume from the hydrology results, developing new floodplain boundaries for this area was considered. It was determined that the volume of stormwater

runoff still exceed the volume of the ponding area below the elevation of the BNSF railroad track.

This flooding location has been eliminated from consideration due to the estimation that the boundary of the floodplain would not change based on new runoff volume parameters.

6.2.19 Northern and Orangewood between 67th and 75th Avenue

According to the hydrology analysis conducted as part of the Glendale Stormwater Management Plan, the peak discharge during the 100-year storm event is approximately 721 cfs is flowing across Northern Avenue and 618 cfs flows is flowing across Orangewood between 67th and 75th Avenue.

There is an existing storm drain from 71st Avenue to 75th Avenue in Northern Avenue. The storm drain in Northern transitions from 36-inches at 71st Avenue to 60 inches at 75th Avenue. Currently a 66-inch storm drain in Orangewood Avenue conveys the runoff from a regional detention basin at the southeast intersection of Northern and 67th Avenue to a surge basin with a capacity of approximately 98 ac-ft. The surge basin outlets to a 42-inch storm drain in Orangewood Avenue. The 42-inch storm drain transitions to a 48-inch storm drain near 75th Avenue.

This flooding location has been eliminated from consideration due to the future construction of the Northern Parkway, which will change the drainage patterns in the area. A drainage system will be included in the Northern Parkway design and will effectively eliminate the flows crossing over Northern and Orangewood Avenues. If flows are diverted to the half mile streets in this area, it is anticipated that connections will be made to the existing stormwater conveyance systems in the area and will be properly sized.

6.2.20 Northern between 83rd and 91st Ave

According to the hydrology analysis the estimated peak discharge during the 100-year storm event, there is approximately 829 cfs flowing south across Northern Avenue between 83rd and 91st Avenue (176 cfs in the 10-year event).

Currently a 72-inch diameter storm drain conveys stormwater west in Northern Avenue approximately a distance 1,400 ft to a surge basin with a capacity of approximately 62 acre-feet. The surge basin outlet is a 42-inch diameter storm drain in Northern Avenue. This storm drain transitions to a 60-inch diameter storm drain near 91st Avenue. The existing storm drains and surge basin are owned and maintained by the City of Peoria.

The results of the hydrology show that the runoff volumes from the 10- and 100-year storm events are approximately 32 and 206 acre-feet, respectively.

This flooding location has been eliminated from consideration due to the future construction of the Northern Parkway, which will change the drainage patterns in the

area. A drainage system will be included in the Northern Parkway design and stormwater that flows into Glendale from Peoria will be diverted elsewhere.

6.3 Results for Local Flooding Issues

6.3.1 Grand Avenue between Glendale Avenue and Northern Avenue

Locations along Grand Avenue between Glendale Avenue and Northern Avenue flood during moderate storm events. The existing inlets along Grand Avenue are very small and do not have a sizable capacity to capture runoff. The flooding along Grand Avenue creates backwater flooding on the local streets.

6.3.2 Beardsley Road and 55th Avenue (Drainage Problem #285)

This drainage issue was documented from the complaints compiled during the storms of 1990. The runoff flows from the northeast to the southwest across 55th Avenue to the 55th Avenue drainage channel. A subdivision wall blocks the natural drainage path so that stormwater concentrates north of the subdivision. The street is constructed with a crown which blocks the flowpath and causes ponding within the right of way and on the adjacent property. The property on the north side of the residential subdivision wall is flooded during rain events.

6.3.3 Inlet at 61st Avenue and Basin at Sahuaro Ranch Park

61st Avenue intersects the park on the north side. There are two catch basins located along 61st Avenue and two catch basins located adjacent to the park directly east of 61st Avenue that collect stormwater and convey it through a 24-inch storm drain to Sahuaro Park. Complaints of flooding indicate that the catch basins may not be adequately sized to prevent flooding.

6.3.4 Amphitheatre

The amphitheatre located at the City of Glendale City Hall complex and currently has no outlet for local runoff that has accumulated in the amphitheater. Runoff collects in the lower area of the amphitheatre and is pumped to the park area at street level. During major events, the storm runoff exceeds the capacity of the park, overtops the berm between the upper and lower levels of the amphitheatre and drains back into the amphitheatre.

6.3.5 52nd Lane and Crocus Dr (Drainage Problem #211)

This drainage issue was documented from the complaints compiled during the storms of 1990. Flooding occurs on the property at the northwest corner of 52nd Lane and Crocus Drive during minor storm events. Traffic compounds the problem by creating wave action in the ponded water. According to the complaints database this is a low area in the road. A low area is not observed on the 2-foot topographic data.

This drainage issues was considered, but eliminated because little benefit is derived from alternatives with high cost.

6.3.6 Orangewood Avenue east of 79th Avenue

Existing flooding issues occur at the intersection of Orangewood and 78th Avenue. The intersection of 78th Avenue and Orangewood Avenue contains a low point where runoff collects and is unable to reach Orangewood Avenue where the existing storm drain is located.

This drainage issue was considered, but eliminated due to the issue being located within unincorporated Maricopa County, outside of the City of Glendale limits.

6.3.7 Along 67th Avenue north of Glendale

Ponding occurs in flat areas along 67th Avenue north of Glendale during storm events. There is no curb and gutter along the east side of the street.

This drainage issues was considered, but eliminated because it is already part of the City of Glendale improvement plans.

7.0 Alternatives Formulation and Analysis

7.1 Alternative Formulation

After the flooding issues were identified and using the results of the existing drainage system analysis and hydrology update, alternatives for mitigating the flooding issues were formulated, screened, and then analyzed. To start the process, the project team consisting of individuals from the City, District, and KHA conducted an Alternatives Formulation Workshop to facilitate the formulation and development of stormwater conveyance strategies to mitigate potential flooding issues. The workshop was conducted with the City and the District on March 16, 2010.

At that meeting, the flooding issues were reviewed and potential alternatives for mitigating them were identified. Following the meeting, advantages and disadvantages of each alternative were described and a magnitude of cost was estimated to facilitate the selection of which alternatives will be included in the alternatives analysis. The magnitude of cost for each alternative was ranked as either high, medium, or low based on general design elements. For example, if the alternative requires the purchase of developed property, the cost would be high relative to other alternatives. The cost for acquiring undeveloped parcels would be in the medium range. The cost of a storm drain alternative would vary depending on the size and location of the storm drain. Additionally, the cost of doing nothing may have a low cost in dollar value, but other factors such as safety or continued maintenance may cause the alternative to have a high magnitude of cost.

Each formulated alternative was then reviewed by the team and those alternatives selected for further analysis were identified during an Alternatives Formulation Review Meeting held with the City and the District on August 10, 2010. Some of the alternatives and flooding issues were eliminated from further analysis due to one or more of the following conditions:

- High cost from acquisition of developed land;
- Cost of the alternative far outweighs the relative benefit of the alternatives;
- Minor drainage issue does not provide much benefit compared to cost.

The remainder of the alternatives were selected to proceed to a Level II alternatives analysis were identified. A location of the flooding issues address is in Exhibit 4. The results of the alternatives formulation process for the regional flooding issues are summarized in **Table 1**. Results of the alternatives formulation process for the local flooding issues are summarized in **Table 2**. Alternatives selected for further analysis were given a Level II designation. **Exhibit 4** shows the location of the alternatives.

Table 1. Regional Drainage Alternative Formulation Results Summary

Location	Alternative	Magnitude of Cost	Result
55th Avenue-Union Hills to ACDC	Do Nothing	Low	Level II Analysis
	Storm Drain in 55th Avenue	High	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	High	Eliminated
ACDC Access at Thunderbird Road and 59th Avenue	Do Nothing	Low	Level II Analysis
	Storm Drain	High	Level II Analysis
	Development restriction by a required drainage easement	Low	Level II Analysis
	Administrative Floodplain	Low	Level II Analysis
67th Avenue and Sack Drive	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Retention Basin	Medium	Eliminated
51st Avenue North of Olive	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	High	Eliminated
	Storm Drain with Detention Basin	High	Level II Analysis
51st Avenue between Northern and Olive	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	Medium	Eliminated
	Storm Drain with Detention Basin	Medium	Level II Analysis
55th Avenue between Northern and Olive	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Open Channel	High	Eliminated

Location	Alternative	Magnitude of Cost	Result
	Detention Basin	Medium	Eliminated
	Storm Drain with Detention Basin	Medium	Level II Analysis
59th Avenue between Northern and Olive	Do Nothing	Low	Level II Analysis
	Storm Drain	High	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	Medium	Eliminated
	Storm Drain with Detention Basin	High	Level II Analysis
Maryland Lakes and Rose Lane Park	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Eliminated
	Connect to 43rd Avenue Basin	Medium	Level II Analysis
Glendale Avenue between 51st and 59th Avenue	Do Nothing	Medium	Level II Analysis
	Storm Drain in Glendale Avenue	High	Level II Analysis
	Storm Drain in Glenn Drive	Medium	Level II Analysis
	Storm Drain in Palmaire Avenue	Medium	Level II Analysis
	Detention Basin	High	Level II Analysis
	Storm Drain with in-line Detention Basin	High	Level II Analysis
	Underground Retention	High	Level II Analysis
59th Avenue between Camelback and Bethany Home	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	High	Eliminated
	Storm Drain with Detention Basin	Medium	Level II Analysis
59th Avenue between Camelback and Bethany Home	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis

Location	Alternative	Magnitude of Cost	Result
	Open Channel	High	Eliminated
	Detention Basin	Medium	Eliminated
	Storm Drain with Detention Basin	Medium	Level II Analysis
71st Avenue North of Camelback	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Open Channel	High	Eliminated
	Detention Basin	Medium	Eliminated
Camelback Road and 91st Avenue	Do Nothing	Low	Level II Analysis
	Storm Drain	Medium	Level II Analysis
	Detention/Retention Basin	Medium	Level II Analysis
	Open Channel	Medium	Eliminated
	Administrative Floodplain	Low	Level II Analysis
Drainage of Major Arterials	Do Nothing	Low	Level II Analysis
	Storm Drains	High	Level II Analysis
	Open Channels	High	Eliminated
	Detention Basins	High	Eliminated
Drainage of half-mile streets	Do Nothing	Low	Level II Analysis
	Storm Drains	High	Level II Analysis
	Open Channels	High	Eliminated
	Detention Basins	High	Eliminated

Table 2. Local Drainage Alternatives Formulation Results Summary

Location	Alternative	Magnitude of Cost	Result
Grand Avenue between Glendale and	Do Nothing	Low	Level II Analysis

Location	Alternative	Magnitude of Cost	Result
Northern	Enlarge Inlets	Low	Level II Analysis
	Detention Basins	High	Eliminated
Beardsley Road and 55th Avenue	Do Nothing	Low	Level II Analysis
	Inlet with Storm Drain	Medium	Eliminated
	Valley Gutter	Low	Level II Analysis
Inlet at 61st Avenue and Basin at Sahuaro Ranch Park	Do Nothing	Low	Level II Analysis
	Curb Cut	Low	Level II Analysis
	Replace Drywell with Outfall Structure	Medium	Level II Analysis
Amphitheatre	Do Nothing	Low	Level II Analysis
	Storm Drain to North	Medium	Level II Analysis
	Storm Drain to South	Medium	Level II Analysis
	Storm Drain to New Glenn Drive Storm Drain	Medium	Level II Analysis

7.2 Alternatives Analysis

A Level II Analysis of the formulated alternatives included, a general concept, design, and size of the facility necessary, a review of potential public utility and private irrigation conflicts, and an opinion of the probable cost of the alternative. Schematics for each alternative were developed. Following the alternatives analysis, the project team including the City, District, and KHA held a series of two alternative review meetings. The alternatives were reviewed, evaluated, and scored. A recommended alternative for each flooding issue was selected and concept plans were developed for each recommended alternative.

7.2.1 Alternatives Analysis Evaluation Criteria

The alternatives were evaluated based on several categories to determine which alternatives would become the Level III Recommended Alternative for each project area. A description of each category used to evaluate the alternatives is given below.

Life Cycle Costs

Life cycle costs include construction costs, operation and maintenance, and the current costs. Current costs are the costs associated with damages that occur from any flooding and would be included in the cost of a do-nothing alternative.

A '+' score indicates a lower life cycle costs compared to the other alternatives for the specific project issue. This will typically be the do-nothing alternative since current costs and operation and maintenance are typically lower than construction costs.

A score of '0' indicates medium life cycle costs compared to other alternatives for the project issue. An example of this would be a storm drain which typically has higher costs than a do-nothing alternative, but a lower cost compared to a storm drain with a detention basin.

A '-' cost indicates a higher life cycle costs compared to all other alternatives. A example of this would be a storm drain with a detention basin, which typically has a highest cost because of the cost of construction, the cost of land acquisition for the detention basin, and the higher operation and maintenance cost for a basin.

Life Safety

Life safety is specific to alternatives involving access to and from emergency services such as hospitals, police and fire stations or emergency evacuation routes. Construction of the alternative in these areas could improve access to emergency services. Construction of the alternative could also increase the ability of the emergency services providers to respond to calls because flooding in an area has been reduced by the construction of the alternative. The alternative would decrease flooding along a street or at an intersection so an emergency vehicle is not impeded by the flooding itself or by traffic delays caused by the flooding. Basically, improved access to and from these emergency services could decrease the emergency response time during a flooding event.

A '+' score means that the project will improve access to and from emergency services and emergency evacuation routes during storm events and reduce life safety issues.

A '0' score means that the project will have no impact on access to and from emergency services or emergency evacuation routes.

A '-' score means that the project will not improve access to and from emergency services or emergency evacuation routes and will not reduce life safety issues.

Impact on Traffic

Impact on traffic considers if traffic will be impeded during a storm event should the alternative improvement not be made. The traffic impact criterion may also include major disruption to traffic during construction even though it is temporary.

A '+' score indicates the traffic will not be less impacted by flooding for a 10-year event. An example of this is an alternative that provides protection for the entire estimated peak discharge from the 10-year return frequency event.

A '0' score would indicate an improvement that decreases the amount of stormwater in the street, but is at a level of protection less than the 10-year event.

A '-' score indicates the alternative does not improve the flooding impacts in the street during a storm event. An example of this would be a do-nothing alternative.

Community Acceptance

The community acceptance criterion is an assumption of how the local community will react to the alternative being selected and administered. Community acceptance includes the general public, stakeholders, adjacent property owners, local homeowners associations, and government officials.

A '+' score designates an alternative that the community would likely endorse. An area with a large flooding problem that could be fixed would be widely accepted by the community to protect the local residents.

A '0' score shows an alternative that does not have a large impact on the local community.

A '-' score would include an alternative that the local community would not likely endorse. Some local communities may feel that a particular solution would not offset the issues presented during construction and post-construction.

Multi-Use Opportunities

The multi-use opportunity criterion assesses the ability of an alternative to be used as a multi-use facility.

A '+' score indicates that the alternative could be used by the local community as a multi-use facility.

A '0' score shows that the alternative could not be used by the local community as a multi-use facility.

A '-' score was not used for this criterion.

Area Protected

This criterion consists of evaluation the protection an alternative will provide.

A '+' in this criterion indicates the alternative will provide a level of protection up to the 10-year return frequency storm event.

A '0' score indicates the alternative will provide protection for the local street but not for the surrounding subdivisions.

A '-' score indicates the alternative will provide a level of protection less than the 10-year event.

Storm drain construction provides a long term benefit to properties immediately adjacent to the project. The benefits include:

- Reduced flooding on the adjacent properties and subsequent reduction in property damage.
- Improved access into the property because driveways etc are not flooded.

In addition to the benefits to the adjacent properties, storm drains provide benefits to the overall traveling public. These benefits include:

- Eliminates or minimizes delays or detours due to streets being flooded.
- Reduces the street maintenance due to the deterioration of the existing pavement caused by flooding.
- Improved access into businesses and residential subdivisions.
- Improves emergency response times.

7.3 Assumptions and Limitations

Each alternative that advanced to a Level II analysis has an alternative summary. The opinions of probable construction cost are located in **Appendix E**. The assumptions used in the preparation of the opinion of probable cost are as follows:

- All costs are based on recent construction prices. Estimated unit costs are based on bid tabs obtained from projects completed around the time this report was prepared.

- The storm drain designs conducted for this report were based on full flow design. No surcharging of the storm drains was assumed.

- The contingency costs included in each of the opinions of probable cost include rip rap, grading, toe-downs, utility conflicts and other various minor costs that may be incurred during construction.

- Vacant land shown for the location of a retention/detention basin is assumed available for potential acquisition. Land that was not available was identified in the Level I Alternative Formulation phase.

- The costs for the "Do-Nothing" alternative can be substantial over the 50 year life expectancy of a typical storm drain or retention basin. The cost for a do-nothing

alternative was estimated. Several different considerations were given, which include:

- Traffic delays create additional fuel costs as well as air pollution due to idling automobiles;
- Detours create additional travel miles when roads are blocked due to flooding as well as increased congestion on adjacent streets;
- Increased maintenance costs for deteriorating pavement.
- Assumptions include:
  - 50-year design life;
  - Flooding delays 5 times per year;
  - Detours required once per year;
  - Flooding occurs during afternoon peak traffic;
  - Detour lengths are minimum of 2 miles at $0.50 per mile.

A summary of the alternatives evaluation is in **Table 3**. The Glendale Area SMP project team including City and District officials met to rank all of the alternatives based on the analysis of the alternatives.

Table 3. Alternatives Analysis Summary

Alternative	Priority Matrix / Rank each category						
	Life Cycle Costs	Life Safety	Impact on Traffic	Community Acceptance	Multi-Use Opportunities	Areas Protected	Recommended Plan
55th Avenue Between Union Hills and the ACDC							
Do Nothing	0	0	-	0	0	-	
Storm Drain to ACDC	-	0	+	+	0	+	*
ACDC Access at Thunderbird and 59th Avenue							
Do Nothing	0	-	-	0	0	-	
Storm Drain to ACDC	-	+	+	+	0	+	*
Development Restriction to Require Drainage Easement	0	0	0	-	0	0	
Administrative Floodplain	+	0	0	0	0	0	
67th Avenue Between and Arrowhead Hospital							
Do Nothing	0	-	-	0	0	-	
Storm Drain from Sack Drive to Union Hills Dr.	+	+	0	+	0	0	*
51st Avenue North of Olive Avenue							
Do Nothing	0	-	-	-	0	-	
Storm Drain from Olive Avenue to Cholla	-	+	0	+	0	0	*
51st Avenue Between Northern and Olive Avenue							
Do Nothing	+	-	-	-	0	-	
Storm Drain from Northern to Olive	0	+	0	+	0	0	*
Storm Drain with Detention/Surge Basin	-	+	+	-	+	+	
55th Avenue Between Northern and Olive Avenue							
Do Nothing	+	0	-	0	0	-	
Storm Drain from Northern to Olive	0	0	0	0	0	0	
Storm Drain with Detention/Surge Basin	-	0	+	+	+	+	*
59th Avenue Between Northern and Olive Avenue							
Do Nothing	+	-	-	-	0	-	
Storm Drain from Northern to Olive	0	+	0	+	0	0	
Storm Drain with Detention/Surge Basin	-	+	+	+	0	+	*
Maryland Lake and Rose Lane Park Basins							
Do Nothing	0	-	-	-	+	-	
Connect to ADOT Basin at 43rd Avenue	-	+	+	+	+	+	*
Glendale Avenue Between 51st and 58th Avenue							
Do Nothing	0	-	-	-	0	-	
Storm Drain in Glendale Avenue	-	0	0	-	0	+	
Storm Drain in Glenn Drive	+	+	+	+	0	+	*

Alternative	Priority Matrix / Rank each category						
	Life Cycle Costs	Life Safety	Impact on Traffic	Community Acceptance	Multi-Use Opportunities	Areas Protected	Recommended Plan
Storm Drain in Palmaire Avenue	+	+	+	+	0	+	
Storm Drains with Detention/Surge Basins	-	+	+	-	+	+	
Underground Retention	-	+	+	+	0	+	
59th Avenue Between Camelback Road and Bethany Home Road							
Do Nothing	+	-	-	0	0	-	
Storm Drain from Camelback to Bethany Home	0	+	+	0	0	+	*
Storm Drain with Detention/Surge Basin	-	+	+	-	+	+	
67th Avenue Between Camelback Road and Bethany Home Road							
Do Nothing	+	-	-	0	0	-	
Storm Drain from Camelback to Bethany Home	0	+	+	0	0	+	*
Storm Drain with Detention/Surge Basin	0	+	+	-	0	+	
71st Avenue North of Camelback Road							
Do Nothing	+	-	-	0	0	-	
Storm Drain from Camelback to Missouri Avenue	0	+	+	0	0	+	*
Camelback Road and 91st Avenue							
Do Nothing	0	-	0	0	0	-	
Storm Drain	0	+	-	0	0	0	
Detention/Retention Basin	-	+	0	0	+	+	*
Administrative Floodplain	+	0	0	0	0	0	
Grand Avenue Between Glendale Avenue and Northern Avenue							
Do Nothing	0	0	-	-	0	-	
Enlarge Inlets	-	+	+	+	0	+	*
Beardsley Road and 55th Avenue							
Do Nothing	0	0	0	-	0	-	
Valley Gutter Across 55th Avenue	+	0	0	+	0	+	*
Inlet at 61st Avenue and Basin at Sahuaro Ranch Park							
Do Nothing	+	0	0	0	0	-	
Curb Cut	0	0	0	+	0	+	*
Replace Drywell with Outfall Structure	-	0	0	+	0	+	
Pump Station Improvements at City Hall							
Do Nothing	+	0	-	-	0	-	
Pump Stormwater to North	0	0	0	0	0	0	
Pump Stormwater to South	+	0	0	0	0	0	
Pump Stormwater to North into New Glenn Drive Storm Drain	-	0	+	+	0	+	*

8.0 Recommended Projects

Following the alternatives analysis, the recommended projects were selected. The recommended projects are listed below. For each recommended project, a description was given, the flooding issue was described again, the level of flood protection was estimated, the area protected by the project were described, potential public utility and private irrigation, and an opinion of the project cost was estimated.

8.1 55th Avenue between Union Hills and the ACDC

8.1.1 Recommended Project Description

This project has three main storm drain elements:

1. A storm drain in 55th Avenue ranging from 36 to 48-inches in diameter between Thunderbird Road and Greenway Road connecting to an existing 48-inch diameter stub out in Thunderbird Road.

2. A 54-inch diameter storm drain in Greenway Road between 55th and 59th Avenue connecting to a storm drain to an existing 54-inchd diameter stub-out in 59th Avenue.

3. A storm drain in 55th Avenue ranging from 48 to 54-inches in diameter between Greenway Road and Paradise Lane that will connect to the proposed Greenway Road storm drain.

There is an existing 48-inch storm drain stub out located at Thunderbird Road and 55th Avenue. The stub-out connects to the 60-inch diameter Thunderbird Road storm drain which outlets into the ACDC. The storm drain will capture flow that crosses over 51st Avenue from Phoenix and stormwater flow in and around 55th Avenue.

8.1.2 Flooding Issue

Significant flows occur along 51st Avenue from Thunderbird Road to Bell Road during the 100-year storm event. These flows are entering from the City of Phoenix. There is a City of Phoenix owned storm drain located in 51st Avenue from the ACDC to Union Hills Drive, but it does not have the capacity to capture the entire 10-year peak discharge rate flowing into Glendale.

The 10-year peak discharge in this area is approximately 400 cfs and the total is 67 ac-ft. Volumes and peak discharges for one-mile arterial street segments along 51st Avenue between Bell Road and Thunderbird Road are presented in **Table 4.** -Year Peak Discharges and Volumes along 51st Avenue Crossing in Glendale.

Table 4. -Year Peak Discharges and Volumes along 51st Avenue Crossing in Glendale.

Upstream Street	Downstream Street	10-yr Peak Discharge (cfs)	10-yr Volume (ac-ft)
Bell Road	Greenway Road	230	36
Greenway Road	Thunderbird Road	170	31

8.1.3 Level of Protection

This storm drain will have the capacity to convey the peak discharge from the 10-year return frequency storm event.

8.1.4 Area Protected

This project will offer flood protection to about 1.8 square miles between Thunderbird Road and Bell Road and between 51st and 59th Avenue. About half of that area between 55th and 59th Avenue will be directly protected by the storm drains. The other half of the area between 51st and 59th Avenues is indirectly benefited because the project provides a drainage outfall. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge. Emergency responders will also have fewer traffic delays caused by flooding event.

8.1.5 Utilities

Currently there is an existing 12-inch water main and a 10-inch water main in 55th Avenue. Utility conflicts are likely. There are also existing utilities in Greenway Road.

8.1.6 Anticipated Right-of-Way Needs

It is anticipated that no new right-of-way will need to be acquired for this project.

8.1.7 Estimated Cost

Table 5. 55th Avenue between Union Hills and the ACDC Estimated Probable Cost of Construction

Alternative Description	Cost
Storm Drain in 55th Avenue from Thunderbird Road to Paradise Lane	$2,950,000

8.2 ACDC Access at 59th Avenue South of Thunderbird Road

8.2.1 Recommended Project Description

This project consists of a large inlet system to capture stormwater at the low point of Thunderbird Road near Eugie Avenue and convey it through a two-barrel eight-foot span by four-foot rise concrete box culvert to the ACDC.

This project eliminates local flooding south of the intersection of Thunderbird Road and 51st Avenue. It is to convey the peak discharge for the 100-year storm event so there is no disconnect between the 100-year capacity of the ACDC and a lower capacity of inlets. The project provides a permanent outfall to the ACDC that cannot be altered by re-development of surrounding properties that are currently used to convey the flow to the ACDC. This project does not require stormwater to be conveyed across private land to the ACDC as in the existing condition thereby not encumbering the private parcel with development restrictions.

8.2.2 Flooding Issue

There are three stormwater conveyance facilities in the area of Thunderbird Road and 59th Avenue-a storm drain in Thunderbird Road, a storm drain in 59th Avenue, and the ACDC. The storm drains in 59th Avenue and Thunderbird Road were designed to convey the 10-year street flow rainfall event. The ACDC was constructed in the 1980's and conveys the peak discharge from the 100-year event for the area north of the Arizona Canal to the New River. The ACDC was designed to be the ultimate outfall for stormwater runoff in this area.

There are both storm drain inlets and overland inlets to convey stormwater flow into the ACDC. An overland inlet was located along the north side of Thunderbird Road west of 59th Avenue. This inlet was blocked when a commercial building was constructed on an elevated pad between the ACDC and 59th Avenue on the north side of the Thunderbird Road. The new inlet is located south of Thunderbird Road and flows across a commercial property called the Sunset Gardens nursery, which has recently closed.

Future development of the nursery property could again block the inlet for stormwater into the ACDC. As a result stormwater flow in excess of the 10-year event that exceeds the capacity of the Thunderbird Road storm drain will flow south across Thunderbird Road and pond at a low spot near the intersection of Eugie Avenue and 59th Avenue. In addition, there is very little flood protection along 59th Avenue south of Thunderbird Road. There is a 21-inch diameter storm drain in the street.

Ponding in this area can restrict access to Banner Hospital east of the intersection of 59th Avenue and Thunderbird Road and other medical facilities in the vicinity. Flooding along 59th Avenue could cause traffic delays and could delay the response of emergency vehicles along 59th Avenue and intersecting streets.

8.2.3 Level of Protection

This project is sized to convey the peak discharge from the 100-year return frequency storm event which is 1,370 cfs.

8.2.4 Area Protected

This project would directly benefit approximately an area of 0.25 square miles near the low point at Eugie Avenue and 59th Avenue which includes the Banner Hospital. This project would indirectly benefit approximately two square miles of are upstream of the low point at Eugie Avenue and 59th Avenue by providing a dedicated outfall for stormwater flow into the ACDC.

8.2.5 Utilities

Currently there is an existing 12-inch diameter sanitary sewer located on the west side of 59th Avenue. Any storm drain that will be constructed to discharge into the ACDC will have to cross the sanitary sewer. There are smaller waterlines and connections that would need to be relocated off the west side of 59th Avenue.

8.2.6 Anticipated Right-of-Way Needs

It is not anticipated that any new right-of-way will be needed for this project. The alignment of the concrete box culvert is in City of Glendale right-of-way or Flood Control District ACDC right-of-way.

8.2.7 Estimated Cost

Table 6. Estimated Probable Cost of Construction

Alternative Description	Cost
ACDC Assess at 59th Avenue South of Thunderbird Road	$1,200,000

8.3 67th Ave and Arrowhead Hospital

8.3.1 Recommended Project Description

This alternative consists of installing approximately 1,300 feet of 24-inch diameter storm drain extending from an existing stub-out in the Union Hills Drive 33-inch diameter storm drain south north to Sack Drive. Inlets will be located near the Arrowhead Hospital driveways and Sack Drive to collect runoff and improve access to the hospital during flooding events. The storm drain will collect local drainage along 67th Avenue and will improve access to the hospital and medical facilities during flooding events.

The existing 33-inch storm drain along 67th Avenue contains a 24-inch stub-out extending north of the intersection along 67th Avenue, which allows for an ultimate outfall without altering the existing storm drain.

8.3.2 Flooding Issue

Ponding accumulates at the intersection of 67th Avenue and Sack Drive during relatively small rainfall events. Flooding also occurs in the existing citrus field northeast of the Sack Drive and 67th Avenue intersection. This creates more difficult access into the Arrowhead Hospital during flooding events. Water ponds and spills into the street causing pavement degradation and access problems into other medical facilities adjacent to the hospital.

Existing stormwater conveyance facilities in this area consist of an existing 33-inch diameter storm drain in 67th Avenue south of Union Hills Drive. There is an inlet on the north east corner of 67th Avenue and Union Hills Drive. There is another 24-inch diameter storm drain that starts approximately 500 feet west of 67th Avenue and runs westerly to the 71st Avenue Drain.

8.3.3 Level of Protection

The full flow capacity of a 24-inch storm drain is approximately 12 cfs. This capacity is just under 50% of the 10-year storm event. According to the results from the hydrology analysis, the 10-year peak discharge at Union Hills Drive and 67th Avenue is approximately 26 cfs. Upsizing the storm drain to convey the peak discharge from the entire 10-year event would require the downstream systems to be upgraded as well and would cost prohibitive.

8.3.4 Area Protected

This project directly protects a very small area near the intersection of 67th Avenue and Sack Drive. The over arching benefit of the project is to provide better access to and from the Thunderbird Hospital during rainfall and runoff events.

8.3.5 Utilities

There is an existing 30-inch sanitary sewer and an existing 12-inch water main located within 67th Avenue, which may be affected by the construction of a storm drain. It is anticipated that neither of these utilities will require major realignment for the construction of the storm drain.

8.3.6 Anticipated Right-of-Way Needs

Additional right-of-way for this project is not anticipated. The project will be construction within City of Glendale right-of-way.

8.3.7 Estimated Cost

Table 7. Estimated Probable Cost of Construction

Alternative Description	Cost
Storm Drain at 67th Avenue and Arrowhead Hospital	$390,000

8.4 51st Avenue North of Olive Avenue

8.4.1 Recommended Project Description

This alternative consists of four storm drain elements

1. A 54-inch diameter storm drain in 51st Avenue between Cholla Street Peoria Avenue;
2. A 54-inch diameter storm drain in Peoria Avenue between 51st Avenue and approximately 300 feet east of 47th Avenue;
3. A 60-inch diameter storm drain in 51st Avenue between Peoria Avenue and Mountain View Road;
4. A 66-inch diameter storm drain in 51st Avenue between Mountain View Road and Olive Avenue.

Flow from the two 54-inch diameter storm drains will discharge into the 60-inch diameter storm drain, then into the 66-inch diameter line. There is an existing 66-inch diameter stub out in the Olive Drain at 51st Avenue. Each storm drain will consist of storm drain pipe, inlet structures, and appurtenances. The storm drain will include inlets to capture runoff and stub outs for various side streets that intersect with 51st Avenue.

8.4.2 Flooding Issue

51st Avenue is a major arterial within the City of Glendale that experiences flooding during moderate storm events. There are no existing storm drainage facilities along 51st Avenue north of Olive Avenue and south of the ACDC. Housing developments east of 51st Avenue were constructed prior to the development of retention/detention guidelines by the City of Glendale. As a result, stormwater runoff from these lots drains into the streets and eventually flows toward 51st Avenue. The runoff exceeds the conveyance capacity of the 51st Avenue, which results in ponding at the intersections north of Olive Avenue. City personnel have also indicated a flooding occurs along Peoria Avenue east of 51st Avenue. Flooding along 51st Avenue and particularly at the major intersections impedes traffic, could delay emergency responders, and could cause premature deterioration of the roadway pavement.

There is an existing 78-inch diameter storm drain in Olive Avenue that conveys stormwater flow to the Loop 101 channel several miles to the west. There is a 66-inch diameter stub-out in the Olive Avenue Drain at 51st Avenue.

The results of the hydrologic analysis indicate that the peak discharge rate for the 10-year return frequency storm event is 468 cfs along 51st Avenue north of Olive Avenue. The peak discharges for one-mile arterial street segments are presented in **Table 8**. The 10-year storm event produces a total runoff volume of 93 acre-feet.

Table 8. 10-Year Peak Discharges.

Location of Discharge	Upstream Street	Downstream Street	10-yr Peak Discharge (cfs)
51st Avenue	ACDC	Peoria Avenue	135
Peoria Avenue	43rd Avenue	51st Avenue	91
51st Avenue	Peoria Avenue	Olive Avenue	341

8.4.3 Level of Protection

The full flow capacity of a 66-inch pipe at the street slope of 0.0030 ft/ft is approximately 184 cfs which is approximately 55% of the peak discharge from the 10-year storm event.

8.4.4 Area Protected

The total area benefited by this project is approximately 1.5 squares miles. The area of runoff is between 51st Avenue and 47th Avenue along 51st Avenue north to the ACDC. The project will provide this area with a drainage outfall. The area between 55th and 51st Avenue from Olive to Cholla Street, which is approximately 0.75 square miles is protected from storm events up to the design discharges.

The storm drain alternative improves life safety, has a high community acceptance and improves impacts on traffic up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.4.5 Utilities

There are several utilities located within the 51st Avenue corridor. There are multiple water mains running in 51st Avenue that will need to be considered during design. There is an existing 48-inch water main that is located on the west side of the corridor and will need to be avoided. There is also a 12-inch diameter sanitary sewer in the corridor along the east side of 51st Avenue. An existing SRP irrigation line is located along the west side of 51st Avenue. These utilities will need to be considered during design, including lateral crossings.

8.4.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.4.7 Estimated Cost

Table 9. Estimated Probable Cost of Construction

Alternative Description	Cost
Storm drain-51st Avenue North of Olive Avenue	$ 5,970,000

8.5 51st Avenue between Northern and Olive

8.5.1 Recommended Project Description

This project consists of 3,900 feet of 42-inch diameter storm drain in 51st Avenue that extends from approximately an existing 42-inch stub out in the Northern Avenue storm drain to Barbara Drive south of Olive Avenue. The storm drain includes pipe, inlet structures, and appurtenances.

There is an existing 42-inch diameter stub out from the Northern Avenue storm drain. Connections to the existing system will have less impact on Northern Avenue traffic during construction. The Northern Avenue storm drain was designed to accept some flows from the north.

The storm drain would include inlets with lateral pipes located along 51st Avenue to intercept runoff from the residential streets intersecting with 51st Avenue. A stub out would be placed at Butler Drive.

The storm drain alternative is recommended. The value of the proposed detention basin parcel is significant and there is a portion of the public and City leadership that would prefer to see the parcel developed for the greatest economic benefit.

8.5.2 Flooding Issue

As with the area north of Olive Avenue, 51st Avenue between Olive and Northern Avenues is a major arterial within the City of Glendale that experiences flooding during moderate storm events. Housing developments to the east discharge stormwater into the streets without any retention or detention causing flooding in 51st Avenue. Ponding and flooding has occurred within the square mile spanning Northern Avenue to Olive Avenue between 43rd Avenue and 51st Avenue. There is repeated flooding at the intersection of 51st Avenue and Olive Avenue.

There are no storm drains or detention/retention basins in or along 51st Avenue between Northern and Olive Avenues. There is an existing 66-inch diameter storm drain constructed recently in Northern Avenue that conveys stormwater runoff to a basin near

Northern and 63rd Avenue. The Northern Avenue Storm Drain has an existing 42-inch diameter stub-out at 51st Avenue. The results of the hydrology study indicated the peak discharge rate from the 10-year return frequency storm event is approximately 148 cfs and produces a total runoff volume of approximately 32 acre-feet.

8.5.3 Level of Protection

The full flow capacity of a 42-inch storm drain is approximately 55 cfs. This capacity is approximately 40% of the 10-year storm event.

8.5.4 Area Protected

The project would protect about 0.8 square mile between 55th Avenue and 47th Avenue and between Northern Avenue and Olive Avenue. Half of that area will be protected from a storm event up to the design discharge rate. The other half of the area is benefited by a positive drainage outfall. This project improves life safety, has a higher community acceptance and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.5.5 Utilities

Several public utilities are located within the 51st Avenue corridor that will need to be considered during construction. There is an existing 48-inch water main that is located on the west side of the corridor that should be avoided if possible. Two smaller water mains are located on the east side of 51st Avenue that should be considered. There is an existing 12-inch sanitary sewer located on the east side of 51st Avenue. An irrigation line on the west side of 51st Avenue will need to be considered during construction and will not be easily relocated.

8.5.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.5.7 Estimated Cost

Table 10. Estimated Probable Cost of Construction

Alternative Description	Cost
51st Avenue Storm drain - Northern Avenue to Olive Avenue	$ 1,720,000

8.6 55th Avenue between Northern Avenue and Olive Avenue

8.6.1 Recommended Project Description

Storm drain with retention basin

This project consists of a 60-inch storm drain in 55th Avenue that discharges into the northwest corner of the Glen Lakes Golf Course north of Northern Avenue. The Glen Lake Golf Course will be re-graded to provide retention for the 10-year storm event. The storm drain consists of pipe, inlet structures, and appurtenances. A drain for the basin will connect to the existing 42-inch diameter stub-out in the Northern Avenue storm drain. This alternative has the capacity to convey the 10-year storm event.

8.6.2 Flooding Issue

Flooding occurs along 55th Avenue between Northern and Olive Avenues and ponds at the intersection of 55th and Northern Avenue during moderate storm events. Flows south of Butler have been reported up to a depth of 18 inches and flows into the adjacent neighborhoods.

Construction of the Olive Avenue Drain and the Northern Avenue Storm Drain reduced the amount of stormwater runoff that reaches 55th Avenue. A future storm drain along 51st Avenue will further reduce the runoff that reaches 55th Avenue and decreases the required size of future stormwater conveyance facilities along 55th Avenue.

There are no stormwater conveyance facilities along 55th Avenue. A 72-inch diameter storm drain has been recently constructed in Northern Avenue that has a 42-inch diameter stub-out and inlets at 55th Avenue. The results of the hydrology indicate the peak discharge of the 10-year return frequency storm event is approximately 97 cfs and the runoff volume of approximately 15 acre-feet.

8.6.3 Level of Protection

The project has a 10-year level of protection

8.6.4 Area Protected

This project will protect about 1 square mile of area up to the 10-year level of protection. About half of that area will be directly protected by the storm drain and basin. The other half is indirectly benefited because the project provides a drainage outfall. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.6.5 Utilities

Utilities located within 55th Avenue that could be affected include an existing 12-inch diameter water main, a 12-inch diameter sanitary sewer, and an existing irrigation line.

8.6.6 Anticipated Right-of-Way Needs

It is anticipated that no additional right-of-way will be needed for this project. The City owns the basin property that is operated as a golf course.

8.6.7 Estimated Cost

Table 11. Estimated Probable Cost of Construction

Alternative Description	Cost
Storm Drain and Regional Detention Basin	$2,900,000

8.7 59th Avenue between Northern and Olive

8.7.1 Recommended Project Description

Storm drain with in-line detention basin

This project consists of a storm in 59th Avenue that ranges between 42 and 72-inches in diameter and a proposed off-line detention basin between Laurie Lane and Royal Palm Road. The 42-inch diameter storm drain will be 1,500 feet long. It will drain the basin and connect to an existing 42-inch diameter stub out in the Northern Avenue storm drain. The 72-inch diameter storm drain will extend from the retention basin 2,500 feet north to Alice Avenue. The storm drain consists of pipe, inlet structures, and appurtenances.

The proposed basin will be six feet deep with a capacity of approximately 15 acre-feet. This alternative has the capacity to convey the 10-year storm event. The basin property is currently undeveloped and could be used as a multi-use facility for the City of Glendale.

8.7.2 Flooding Issue

59th Avenue is a major arterial located in the City of Glendale that experiences flooding during moderate sized storm events. This segment of 59th Avenue located between Northern Avenue and Olive Avenue does not have storm water conveyance facilities. Runoff from residential lots east of 59th Avenue discharges into streets and is not detained or retain in basins or on the individual lots. The local streets direct stormwater to 59th Avenue. The ability of 59th Avenue to convey stormwater is exceeded, which results in ponding and flooding along 59th Avenue.

There is no storm drain in 59th Avenue in this area. There is an existing 72-inch diameter storm drain that was constructed recently in Northern Avenue with an existing 42-inch diameter stub-out at 51st Avenue. The results of the hydrology study indicate that the estimated peak discharge from the 10-year return frequency storm event is approximately 195 cfs. The estimated runoff volume is approximately 29 acre-feet.

8.7.3 Level of Protection

This alternative will convey the peak discharge from the 10-year storm event.

8.7.4 Area Protected

This project will protect about 1 square mile of area up to the 10-year level of protection. About half of that area will be directly protected by the storm drain and basin. The other half is indirectly benefited because the project provides a drainage outfall where none currently exists. This project improves life safety, has a higher community acceptance and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.7.5 Utilities

Two public utilities are located within 59th Avenue that should be considered during design and construction. An existing 12-inch water main and an existing 10-inch sanitary sewer are located in 59th Avenue. An SRP irrigation line is located in the 59th Avenue corridor.

8.7.6 Anticipated Right-of-Way Needs

The storm drain will be placed in existing City of Glendale right-of-way. An easement for the basin site is required. The proposed basin site is approximately 3.2 acres.

8.7.7 Estimated Cost

Table 12. Estimated Probable Cost of Construction

Alternative Description	Cost
59th Avenue Storm drain with in-line detention basin	$ 4,010,000

8.8 Maryland Lakes and Rose Lane Park

8.8.1 Recommended Project Description

Connect to ADOT Basin at 43rd Avenue

During construction of the Grand Avenue improvements, ADOT constructed a large detention basin at 43rd Avenue and Grand Avenue. The ADOT basin has a storage capacity of approximately 185 acre-feet. There are three 24-inch pipes and one 18-inch pipe discharging to this basin from Grand Avenue. A 54-inch storm drain in 43rd Avenue also discharges into the basin.

This alternative would involve enlarging the storm drain connecting the Maryland Lakes basin to the Rose Lane Park Basin and re-grading the existing Rose Lane Park retention

toward Bethany Home Road. Existing vacant land between the Rose Lane Park basin and Bethany Home Road will be acquired and developed into a retention basin/conveyance corridor to Bethany Home Road. A storm drain connection will be constructed from Bethany Home Road to the existing retention basin at Carol G. Peck Elementary School, which is adjacent to a City of Glendale existing basin. The storm drain will have catch basins to capture stormwater runoff in Bethany Home Road.

A storm drain connection will be constructed from the existing City retention basins at the northeast corner of Missouri Avenue and Grand Avenue to the existing ADOT basin at 43rd Avenue and Grand Avenue. The storm drain will consist of pipe, inlet structures, and appurtenances. The basins will be connected with storm drain along Missouri Avenue and south through a private easement. There is an existing outfall from the large basin constructed by ADOT but modifications may be needed to coordinate with the existing City of Phoenix storm drain system.

8.8.2 Flooding Issue

The Maryland Lakes and Rose Lane Park detention basins are located northeast of the Bethany Home Road and 51st Avenue intersection. The Maryland Lakes Detention Basin has a storage capacity of 20 acre-feet. Flow into this basin is from a 66-inch diameter storm drain from the north. The Rose Lane Park Basin has a storage capacity of 12.4 acre-feet. A 60-inch diameter storm drain from the north discharges into the basin. The Maryland Lakes basin discharges to the Rose Lane Park basin through a 15-inch diameter storm drain in Marlette Avenue. These storm drains and basins drain significant portions of downtown Glendale.

Both of the basins are undersized for the 10-year return frequency storm event. There is no outfall for the Rose Lane Park basin and these detention basins are flooded during most rain storms. This renders the park facilities within the basins unusable several times per year because there is no outfall.

According to the hydrology results, the peak discharge to the Maryland Lakes and Rose Lane Park basins during the 10-year storm event is 541 cfs. The additional 10-year peak discharge to the downstream ADOT basin is 298 cfs. The total amount of volume generated in the 10-year storm event is 150 acre-feet. The 100-year storm event generates a runoff volume of 342 acre-feet.

8.8.3 Level of Protection

This alternative has the capacity to convey and retain more than the 10-year storm event.

8.8.4 Area Protected

This project will increase the capacity ensures that significant portions of the downtown area have the capacity for the 10-year storm event and will bring the retention capacity of the Maryland Lake and Rose Lane Park basins to a 10-year event. The area that drains to these basins is approximately one square mile of downtown Glendale.

Providing protection for the 10-year storm event does not require modifications to the existing basins and the detention basins could be used as multi-use facilities for the City of Glendale in the future. A proposed community center in the Rose Lane Park Retention Basin could be constructed and the system will still maintain the capacity to convey the 10-year storm event.

The storm drains will improve existing drainage conditions along portions of Missouri Avenue and Bethany Home Road. This will improve life safety and improve impacts on traffic and from flooding up to the 10-year peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by up to a 10-year flooding event.

The runoff from the Maryland Lake and Rose Lane Park basins was originally designed to flow to the Bethany Home Storm Drain as proposed by the Maryvale ADMS. Now runoff from these basins is going south, so this could decrease the required size of the future Bethany Home Storm Drain. In places, the pipe size could be decreased by as much as 12 inches. Also, the existing storm drain in Bethany Home Road from 59th to 53rd Avenues could be adequate to drain the street.

8.8.5 Utilities

Multiple public utilities are located within the Bethany Home Road and Missouri Avenue corridors.

8.8.6 Anticipated Right-of-Way Needs

It is anticipated that approximately 4.6 acres will need to be acquired for the basin site between the Rose Lane Park Retention Basin and Bethany Home Road. It is anticipated that the basin at Carol Peck Elementary School will be donated and that the City will take over operation and maintenance of that basin.

8.8.7 Estimated Cost

Table 13. Estimated Probable Cost of Construction

Alternative Description	Cost
Connect to ADOT Basin at 43rd Avenue	$2,700,000

8.9 Glendale Avenue between 51st and 59th Avenue

8.9.1 Recommended Project Description

Storm Drain in Glenn Drive

This alternative consists of a 78-inch diameter storm drain in Glenn Drive that extends from 52nd Avenue west to the existing 78-inch storm drain in 59th Avenue. The peak discharge from the 10-year storm event north of Glenn Drive will be captured by this

storm drain and conveyed to the west. The storm drain includes pipe, inlet structures, and appurtenances. Storm drain stub outs would be placed to the south of Glenn Drive to capture the maximum amount of runoff that is discharging toward Glendale Avenue.

This storm drain would intercept the majority of the stormwater that would normally reach Glendale Avenue and the downtown area, reducing the need for a larger pipe in Glendale Avenue.

8.9.2 Flooding Issue

Glendale Avenue is an arterial street and provides access to downtown Glendale. Glendale Avenue and portions of downtown Glendale have both experienced flooding for several years. There is an existing 24-inch diameter storm drain in Glendale Avenue between 51st and 59th Avenue, which is significantly undersized to convey the flows that reach Glendale Avenue. The undersized storm drain and lack of elevation to the finished floors mean the street cannot convey anything other than minor storm events. There is no large retention areas in downtown Glendale and lots are not required to provide retention when they are developed.

When ADOT constructed the underpass under 59th and Grand Avenues, a storm drain was constructed in 59th Avenue from Glendale Avenue to Palmaire Avenue, thence to Grand and the basin at 63rd and Northern Avenues. A 42-inch diameter stub out was installed in Glendale Avenue to run east to 51st Avenue.

According to the hydrology results, the estimated peak discharge from the 10-year return frequency storm event is approximately 170 cfs and the runoff volume is approximately 34 acre-feet.

8.9.3 Level of Protection

This storm drain would have the capacity to convey the 10-year storm event.

8.9.4 Area Protected

One square mile of downtown Glendale will benefit from this storm drain. Flows up to the 10-year return frequency event will be captured by the storm drain before entering Glendale Avenue.

8.9.5 Utilities

There is a 10-inch diameter sanitary sewer located in 59th Avenue running north/south near the connection to the existing storm drain in 59th Avenue that will need to be considered during construction. There are several sanitary sewer crossing along Glenn Drive that will require special design to properly construct the proposed storm drain while also avoiding the existing sanitary sewer. Additionally, there is an existing 10-inch diameter water main that is running east/west in the Glenn Drive corridor that will need to be considered during construction.

8.9.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.9.7 Estimated Cost

Table 14. Estimated Probable Cost of Construction

Alternative Description	Cost
Storm Drain in Glenn Drive	$4,310,000

8.10 59th Avenue between Camelback Road and Bethany Home Road

8.10.1 Recommended Project Description

Storm drain

This alternative consists of approximately 3,800 feet of new storm drain in 59th Avenue ranging from 36 to 48 inches in diameter. The proposed storm drain will connect to the existing 78-inch diameter stub out to the Camelback storm drain. The storm drain includes pipe, inlet structures and appurtenances.

According to the Camelback Road storm drain design, the 78-inch storm drain at the intersection of Camelback Road and 59th Avenue has a maximum capacity of 329 cfs. This amount is more than the total runoff computed for this alternative. Therefore, the 36-inch storm drain stub out will be replaced with a 48-inch diameter stub-out.

The storm drain along 59th Avenue will include inlets to capture flows from the residential streets intersecting 59th Avenue. The proposed Camelback Road storm drain was designed with the capacity flows in 59th Avenue north of Colter. The timing of when those flows enter the system should be further investigated.

8.10.2 Flooding Issue

59th Avenue is a major arterial located within the City of Glendale. Runoff from the local streets east of 59th Avenue causes flooding. The 59th Avenue street section does not have the capacity to convey runoff from even minor storms. Runoff accumulates in 59th Avenue but also in the frontage streets adjacent to 59th Avenue, which have a lower elevation than 59th Avenue.

The estimated peak discharge in 59th Avenue is approximately 303 cfs and the volume of runoff is 46 acre feet. An 84-inch diameter storm drain is currently being construction along Camelback Road at 59th Avenue. A 78-inch diameter storm drain will be constructed in 59th Avenue between Colter Street and Camelback Road, which is a distance of 1,400 feet. A 36-inch diameter stub-out will be constructed north of Colter Street. According to the design documentation from the Camelback Storm Drain project,

the storm drain in Camelback was designed to accept flow from 59th Avenue south of Bethany Home Road.

8.10.3 Level of Protection

The project will have a 10-year capacity.

8.10.4 Area Protected

The project would protect about 0.8 square mile between 55th and 63rd Avenues and between Camelback Road and Bethany Home Road. Half of that area will be protected from a storm event up to the design discharge rate. The other half of the area is benefited by a positive drainage outfall. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.10.5 Utilities

A small diameter water main and sanitary sewer lines are located in 59th Avenue that are running north/south. These utilities will need to be considered during construction but they can be relocated at relatively little cost.

An existing irrigation line located within 59th Avenue cannot be relocated. Any storm drain constructed within 59th Avenue will be required to avoid the irrigation line.

8.10.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.10.7 Estimated Cost

Table 15. Estimated Probable Cost of Construction

Alternative Description	Cost
Storm Drain in 59th Avenue	$1,630,000

8.11 67th Avenue between Camelback Rd and Bethany Home

8.11.1 Recommended Project Description

Storm drain

This alternative consists of a 60-inch storm drain in 67th Avenue. The proposed storm drain extends from south of Bethany Home Road south to the existing 36-inch stub out in the Camelback Road storm drain. The storm drain includes pipe, inlet structures, and appurtenances.

According to the Camelback Road storm drain design, the 78-inch storm drain at the intersection of Camelback Road and 67th Avenue has a maximum capacity of 355 cfs. This amount is more than the total runoff computed for this alternative. Therefore, the 36-inch storm drain stub out will be replaced by extending the 60-inch storm drain to the north.

Area inlets will be placed along 67th Avenue to capture local drainage as well as off-site flows. Stub outs will be placed at local street intersections such as Missouri Avenue for future expansion of the storm drain.

8.11.2 Flooding Issue

67th Avenue is a major arterial located within the City of Glendale that has experience flooding and ponding in the past. Runoff from the local streets east of 67th Avenue causes the street and adjacent frontage streets to flood. The street section does not have the capacity to convey runoff from even minor storms.

The estimated peak discharge rate along 67th Avenue from the results of the hydrologic analysis is approximately 282 cfs and the volume of runoff is 55 acre-feet. A 102-inch diameter storm drain is currently being construction along Camelback Road at 67th Avenue. A 78-inch diameter storm drain lateral will be constructed in 67th Avenue than transitions to a 60-inch diameter storm drain for 1,600 feet north of Camelback Road. A 36-inch diameter stub-out will be constructed north of Colter Street.

8.11.3 Level of Protection

The project will have the capacity to convey the peak discharge from the 10-year return frequency storm event.

8.11.4 Area Protected

The project would protect about 0.8 square mile between 55th and 63rd Avenues and between Camelback Road and Bethany Home Road. Half of that area will be protected from a storm event up to the design discharge rate. The other half of the area is benefited by a positive drainage outfall. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.11.5 Utilities

An existing 18-inch sanitary sewer and 12-inch water main are located within the 67th Avenue corridor. The sanitary sewer is a major utility and may be difficult and expensive to be relocated. These utilities should also be considered during design of any storm drain laterals.

An existing SRP irrigation line is located within 67th Avenue on the west side of the corridor that cannot be relocated. Any storm drain constructed within 59th Avenue will be required to avoid the irrigation line.

8.11.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.11.7 Estimated Cost

Table 16. Estimated Probable Cost of Construction

Alternative Description	Cost
67th Avenue Storm drain from Camelback Road to Bethany Home Road	$1,570,000

8.12 71st Avenue north of Camelback

8.12.1 Recommended Project Description

Storm drain

This alternative consists of a 48-inch diameter storm drain in 71st Avenue. The proposed storm drain extends from Missouri Avenue south to the existing 36-inch stub-out in the Camelback Road storm drain. The storm drain includes pipe, inlet structures, and appurtenances.

According to the Camelback Road storm drain design, the 48-inch storm drain at the intersection of Camelback Road and 71st Avenue has a maximum capacity of 122 cfs. This amount is more than the total runoff computed for this alternative. Therefore, the 36-inch storm drain stub out will be replaced by extending the 48-inch storm drain to the north.

The storm drain along 71st Avenue will include inlets to capture flows from the residential streets intersecting 71st Avenue. The Camelback Road storm drain has been designed to handle the flow generated in the surrounding residential areas. The timing of how those flows should be confirmed.

8.12.2 Flooding Issue

71st Avenue between Camelback Road and Missouri Road is a heavily populated area without current stormwater runoff protection. Flooding and ponding occur along 71st Avenue.

The estimated peak discharge along 71st Avenue is 88 cfs for the 10-year return frequency storm event and the volume of runoff is approximately 11 acre-feet. The existing Camelback Road storm drain that is under construction is 102-inches in diameter. An existing 48-inch diameter storm drain lateral extends 280 feet north in 71st Avenue with a 36-inch diameter stub out.

8.12.3 Level of Protection

The full flow capacity of the 36-inch storm drain at the street slope of 0.0045 ft/ft is approximately 45 cfs. This capacity is approximately 50% of the 10-year storm event.

8.12.4 Area Protected

The project would protect about 0.5 square mile between 67th and 75th Avenues and between Camelback Road and Missouri Avenue. Half of that area will be protected from a storm event up to the design discharge rate. The other half of the area is benefited by a positive drainage outfall. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by flooding event.

8.12.5 Utilities

Two public utilities are located in 71st Avenue that should be considered during construction-an existing 8-inch sanitary sewer and an existing 12-inch water main located in the 71st Avenue corridor.

8.12.6 Anticipated Right-of-Way Needs

It is anticipated that no new rights-of-way will need to be acquired for this project. The project will be constructed within the existing City of Glendale right-of-way.

8.12.7 Estimated Cost

Table 17. Estimated Probable Cost of Construction

Alternative Description	Cost
71st Avenue Storm drain from Camelback Road to Missouri Avenue	$1,240,000

8.13 Camelback Road and 91st Avenue

8.13.1 Recommended Project Description

This alternative consists of a retention basin at the northeast corner of the intersection of 91st Avenue and Camelback Road. The proposed basin is offset from the intersection to allow for future development along the roadway. The basin is three-feet deep with a capacity of approximately 36 acre-feet. A detention basin could be used as a multi-use facility for the City of Glendale.

8.13.2 Flooding Issue

The area near the intersection of 91st Avenue and Camelback Road is subject to flooding in significant rainfall events. Stormwater runoff from the northeast pond at the intersection of 91st Avenue and Camelback Road.

An existing 48-inch diameter storm drain in Camelback Road extends west from the Loop 101 drainage channel to 95th Avenue, one-half mile west of the site. The estimated peak discharge from the 10-year return frequency storm event is 186 cfs and the volume of runoff is 24 acre-feet.

8.13.3 Level of Protection

This alternative has the capacity to contain the 10-year storm event.

8.13.4 Area Protected

The area protected by this project is about 0.25 square miles.

8.13.5 Utilities

Existing irrigation delivery systems may need to be relocated. There are no other utility conflicts in the proposed basin site.

8.13.6 Anticipated Right-of-Way Needs

Approximately 13 acres will need to be acquired for the proposed basin site.

8.13.7 Estimated Cost

Table 18. Estimated Probable Cost of Construction

Alternative Description	Cost
Detention Basin/Retention Basin	$ 4,950,000

8.14 Arterial Storm Drains

8.14.1 Recommended Project Description

Arterial streets provide the majority of traffic conveyance within the city. Storm drains in each arterial street would prevent flooding delays during storm events for the public and emergency responders. Storm drains would also mitigate flooding that accumulates at the intersections.

Construction of storm drains in each arterial within the city was not analyzed in detail nor was a plan and profile developed. A limited analysis was completed that included estimating the flows from each section of the city, estimating a required pipe size, and estimating the cost of construction. **Table 19** provides a list of the arterials which do not have storm drains.

Table 19. Estimated Sizes, Lengths and Costs Associated with Storm Drain Construction in the Arterial Streets

No.	Street Segment	From	To	Length (feet)	10-Year Future Flow (cfs)	Pipe Dia. (in.)	Unit Cost	Total Cost
2	Greenway Road	67th Avenue	59th Avenue	4,620	169	66	$435	$2,009,700
3	Greenway Road	59th Avenue	51st Avenue	4,620	173.5	66	$435	$2,009,700
4	Bell Road	67th Avenue	59th Avenue	4,620	90	54	$319	$1,473,780
5	Bell Road	59th Avenue	51st Avenue	4,620	188	66	$435	$2,009,700
6	59th Avenue	Bell Road	Union Hills Drive	4,620	188	66	$435	$2,009,700
10	Camelback Road	83rd Avenue	75th Avenue	4,620	131	60	$377	$1,741,740
11	83rd Avenue	Camelback Road	Bethany Home Road	4,620	132	60	$377	$1,741,740
12	91st Avenue	Camelback Road	Bethany Home Road	4,620	166.5	66	$435	$2,009,700
13	59th Avenue	SR 101	Deer Valley Road	4,620	103	60	$377	$1,741,740
14	67th Avenue	SR 101	Deer Valley Road	4,620	154.5	66	$435	$2,009,700
16	Camelback Road	59th Avenue	51st Avenue	4,620	233	72	$478	$2,210,670
17	Camelback Road	51st Avenue	43rd Avenue	4,620	505	72	$478	$2,210,670
18	51st Avenue	Camelback Road	Bethany Home Road	4,620	505	72	$478	$2,210,670
22	75th Avenue	Camelback Road	Bethany Home Road	4,620	112	60	$377	$1,741,740
23	Bethany Home Road	79th Avenue	71st Avenue	5,280		108	$834	$4,402,200
24	Bethany Home Road	71st Avenue	59th Avenue	7,920		96	$725	$5,742,000
25	Bethany Home Road	59th Avenue	51st Avenue	5,280		66	$435	$2,296,800
26	Bethany Home Road	51st Avenue	47th Avenue	2,640		48	$290	$765,600
27	51st Avenue	Bethany Home Road	Glendale Avenue	4,620	159.5	66	$435	$2,009,700
28	59th Avenue	Bethany Home Road	Glendale Avenue	4,620	187	72	$478	$2,210,670
29	67th Avenue	Bethany Home Road	Glendale Avenue	5,280	389	90	$689	$3,636,600
35	67th Avenue	Glendale Avenue	Orangewood Drive	1,980	81	54	$319	$631,620
34	Glendale Avenue	67th Avenue	59th Avenue	4,620	162	66	$435	$2,009,700
30	75th Avenue	Bethany Home Road	Glendale Avenue	4,620	374	90	$689	$3,182,025
33	Glendale Avenue	75th Avenue	67th Avenue	4,620	124	60	$377	$1,741,740
36	75th Avenue	Glendale Avenue	Orangewood Drive	1,980	62	48	$290	$574,200
31	83rd Avenue	Bethany Home Road	Glendale Avenue	4,620	169	66	$435	$2,009,700
32	91st Avenue	Bethany Home Road	Glendale Avenue	4,620	169	66	$435	$2,009,700

No.	Street Segment	From	To	Length	10-Year	Pipe	Unit	Total Cost
37	Cactus Road	67th Avenue	59th Avenue	4,620	169.5	66	$435	$2,009,700
38	Thunderbird Road	67th Avenue	ACDC	4,620	89	54	$319	$1,473,780
39	Peoria Avenue	67th Avenue	59th Avenue	4,620	168	66	$435	$2,009,700
61	Thunderbird Road	59th Avenue	51st Avenue	4,620	165.5	66	$435	$2,009,700
40	Peoria Avenue	51st Avenue	43rd Avenue	4,620	113	60	$377	$1,741,740
43	Glendale Avenue	83rd Avenue	75th Avenue	4,620	159	66	$435	$2,009,700
45	51st Avenue	Glendale Avenue	Northern Avenue	4,620	191.5	72	$478	$2,210,670
46	59th Avenue	Glendale Avenue	Northern Avenue	4,620	160.5	66	$435	$2,009,700
47	91st Avenue	Glendale Avenue	Northern Avenue	4,620	246	78	$507	$2,344,650
51	67th Avenue	Deer Valley Road	Pinnacle Peak Road	4,620	156.3	66	$435	$2,009,700
53	67th Avenue	Sack Drive	SR 101	3,300	95.7	54	$319	$1,052,700
54	59th Avenue	Union Hills Drive	SR 101	4,620		24	$159	$736,890
55	75th Avenue	Union Hills Drive	SR 101	4,620		24	$159	$736,890
		Total Length (feet)		186,120		**Total Cost**		**$82,708,725**
		Total Length (miles)		35				

Bethany Home Road between 79th and 51st Avenue required clarification. The pipe sizes shown are based on the Maryvale Area Drainage Master Study. The flows assume that the drainage area includes the area east of 51st Avenue and between Bethany Home Road and Northern Avenue. An alternative proposes construction of a storm drain from the basins at Maryland Lakes and Rose Lane to the large basin constructed by ADOT near 43rd Avenue and Grand Avenue. Construction of this alternate will reduce the pipe sizes required for the Bethany Home Road storm drain.

8.14.2 Flooding Issue

The arterial streets provide the majority of traffic conveyance within the city. It is desirable to interrupt the flow of traffic as little as possible during storm events. For this reason, it is proposed to provide drainage for each arterial street within the City limits.

8.14.3 Level of Protection

The level of protection will be near the 10-year return frequency event.

8.14.4 Area Protected

Areas upstream and downstream of the arterial streets will be protected. Areas downstream of the arterials are directly protected. Areas upstream are provided a drainage outfall.

8.14.5 Utilities

There will be public sewer and water utilities in nearly every arterial. There will also be private irrigation in many locations.

8.14.6 Anticipated Right-of-Way Needs

It is anticipated that little new rights-of-way will be needed for the projects.

8.14.7 Estimated Cost

See table Above

8.15 Collector Street Storm Drains

8.15.1 Recommended Project Description

Although the arterial streets convey the majority of traffic within the city, collector streets are the links between the residential and business areas to the arterials. Storm drains in collector streets are desirable to reduce local flooding and improve traffic access. Each square mile of residential or business property has approximately 8,580 feet of collector streets.

8.15.2 Flooding Issue

8.15.3 Level of Protection

The typical level of protection will be for the 10-year storm event for runoff from the ¼ square mile.

8.15.4 Area Protected

One storm drain on every half mile street will protect ¼ to ½ square mile.

8.15.5 Utilities

There will likely be utilities in each collector street.

8.15.6 Anticipated Right-of-Way Needs

It is not anticipated that new right-of-way will be needed.

8.15.7 Estimated Cost

An estimated cost was established for storm drains to be placed on the half mile streets. The average cost for each square mile is $2,300,000. Over the 27 square miles where they will be employed, that would be a total of $63,000,000 for the entire City.

9.0 Recommended Projects for Local Drainage Issues

9.1 Grand Avenue between Glendale Avenue and Northern Avenue

9.1.1 Recommended Project Description

Enlarge inlets

This alternative consists of removing and replacing 13 existing inlets along Grand Avenue between Glendale Avenue and Northern Avenue. The small catch basins will be replaced with larger catch basins that can capture more runoff.

Enlarging the existing inlets to capture more flow in Grand Avenue will reduce the amount of flooding in Grand Avenue along with the backwater flooding in the local streets intersecting with Grand Avenue.

9.1.2 Flooding Issue

Locations along Grand Avenue between Glendale Avenue and Northern Avenue flood during moderate storm events. A larger storm drain was constructed in Grand Avenue as part of the 59th Avenue underpass in 2006, but the capacity of the existing inlets was not increased. The existing inlets along Grand Avenue are very small and do not have a sizable capacity to capture runoff. The flooding along Grand Avenue creates backwater flooding on the local streets.

9.1.3 Level of Protection

The inlets will be sized to capture the peak discharge from the 10-year event.

9.1.4 Area Protected

The areas protected by these inlets will be very small and directly near the inlets and intersections at Grand Avenue. This project improves life safety and improves impacts on traffic and from flooding up to the peak design discharge for the storm drain system. Emergency responders will also have fewer traffic delays caused by a flooding event.

9.1.5 Utilities

Coordination with ADOT will be required for connecting the enlarged catch basins to the existing storm drains. There is an existing 8-inch diameter sanitary sewer located behind the back of curb along Grand Avenue. The proposed inlets should attempt to avoid the existing sanitary sewer line.

9.1.6 Anticipated Right-of-Way Needs

It is anticipated that no new right-of-way data will be needed for this project.

9.1.7 Estimated Cost

Table 20. Estimated Probable Cost of Construction

Alternative Description	Cost
Enlarge Inlets along Grand Avenue between Glendale Avenue and Northern Avenue	$450,000

9.2 Beardsley Road and 55th Avenue

9.2.1 Recommended Project Description

Alternative 3: Valley Gutter across 55th Avenue

This alternative involves constructing a 10-foot wide valley gutter across 55th Avenue just north of Walhalla Lane. The proposed valley gutter will convey flow across 55th Avenue to an existing drainage channel.

9.2.2 Flooding Issue

This drainage issue was documented from the complaints compiled during the storms of 1990. The runoff flows from the northeast to the southwest across 55th Avenue to the 55th Avenue drainage channel. A subdivision wall blocks the natural drainage path so that stormwater concentrates north of the subdivision. The street is constructed with a crown which blocks the flowpath and causes ponding within the right of way and on the adjacent property. The property on the north side of the residential subdivision wall is flooded during rain events.

9.2.3 Level of Protection

The level of protection will be less than the 2-year event.

9.2.4 Area Protected

This project will alleviate flooding on the street at this location.

9.2.5 Utilities

No utility conflicts are anticipated.

9.2.6 Anticipated Right-of-Way Needs

No new right-of-way requirements are anticipated.

9.2.7 Estimated Cost

Table 21. Estimated Probable Cost of Construction

Alternative Description	Cost
Valley Gutter Across 55th Avenue	$60,000

9.3 Inlet at 61st Avenue and Basin at Sahuaro Ranch Park

9.3.1 Recommended Project Description

Curb cut

This alternative consists of constructing a 30-foot curb opening adjacent to the park at 61st Avenue. A concrete spillway will convey runoff from the curb opening to the basin to prevent erosion. The existing storm drain system will not be modified.

9.3.2 Flooding Issue

61st Avenue intersects the park on the north side. There are two catch basins located along 61st Avenue and two catch basins located adjacent to the park directly east of 61st Avenue that collect stormwater and convey it through a 24-inch storm drain to Sahuaro Park. Complaints of flooding indicate that the catch basins may not be adequately sized to prevent flooding.

9.3.3 Level of Protection

The curb cut will be large enough to convey the 10-year flow in the street.

9.3.4 Area Protected

This project will relieve ponding at 61st and Brown.

9.3.5 Utilities

No utility conflicts are anticipated.

9.3.6 Anticipated Right-of-Way Needs

New right-of-way is not anticipated for this project.

9.3.7 Estimated Cost

Table 22. Drainage Estimated Probable Cost of Construction

Alternative Description	Cost
Curb Cut	$40,000

9.4 Amphitheatre at Glendale City Hall

9.4.1 Recommended Project Description

This alternative consists of connecting the existing pump in the amphitheatre to the proposed Glenn Drive storm drain. Approximately 400 feet of the proposed Glenn Drive storm drain will be constructed.

This project will provide positive outlet for the pump station and provide street drainage for Glenn Drive near downtown and eliminate ponding at the intersection of Glenn Drive and 59th Avenue. This will also reduce the cost of the future Glenn Drive Storm Drain.

9.4.2 Flooding Issue

The amphitheatre located at the City of Glendale city hall currently has no outlet for local runoff that has accumulated in the amphitheater. Runoff collects in the lowered area of the amphitheatre and is pumped to the park area at street level. During major events, the storm runoff exceeds the capacity of the park, overtops the berm between the upper and lower levels of the amphitheatre and drains back into the amphitheatre.

9.4.3 Level of Protection

This project will provide a 10-year level of protection for the amphitheatre and for a 500 foot long portion of Glenn Drive.

9.4.4 Area Protected

This will eliminate the drainage issue at the amphitheatre and provide relief for flooding along Glenn Drive and at the intersection of Glenn Drive and 59th Avenue.

9.4.5 Utilities

There is an existing 10-inch diameter water main that is running east/west in the Glenn Drive corridor that will need to be considered during construction. Additionally, there are water main and sanitary sewer crossings at multiple street crossings.

9.4.6 Anticipated Right-of-Way Needs

No new right-of-way requirements are anticipate for this project.

9.4.7 Estimated Cost

Table 23 Estimated Probable Cost of Construction

Alternative Description	Cost
Connect pump to proposed Glenn Drive storm drain	$470,000

10.0 Comparison to Previous Studies

Exhibit 5 compares the Recommended Plan to the previous projects recommended by the 1987 Glendale/Peoria ADMP and ADMPU and the Maryvale ADMS. The Glendale/Peoria ADMP proposed a series of storm drains through the City of Glendale and Peoria that would provide storm drain outfalls for the City of Glendale. The major outfalls proposed by the Glendale/Peoria ADMP in Cactus Road, Olive Avenue, and Orangewood/Glendale Avenue have been constructed.

The Maryvale ADMS recommended the Bethany Home Outfall Channel (BHOC), which benefitted both the Cities of Glendale and Phoenix. Segments of this system are still being constructed in 2011. The projects recommended by the Maryvale ADMS have been constructed with the exception of the Bethany Home storm drain portion of the BHOC.

The only project recommended by the Glendale/Peoria ADMPU that affects the City of Glendale was a channel on the north side of Pinnacle Peak Road and 67th Avenue intercepting flow into the City of Glendale. This project is not officially located within the City of Glendale, though it does protect portions of the City from flooding.

The recommended plan includes many of the same arterial and collector street storm drains recommended by the 1987 Glendale/Peoria ADMP . Ultimately, storm drains are proposed for every arterial and half-mile collector street under the recommended plan.

Runoff from the Maryland Lake and Rose Lane Park basins was originally designed to flow to the Bethany Home storm drain, which is part of BHOC. Runoff from these basins is going south, thereby decreasing the contributing watershed size of the future Bethany Home storm drain. In places, it is estimated that the pipe size could be decreased by as much as 12 inches. Also, the existing storm drain in Bethany Home Road from 59th to 53rd Avenues could be adequate to drain the street.

The CLOMR submitted for the BHOC was developed using rainfall data from NOAA 2. The hydrology completed for the Glendale Area Stormwater Management Plan was developed using NOAA 14. The CLOMR could be reinvestigated using data from NOAA 14.

11.0 Operation and Maintenance

Construction of a storm drain facilities will reduce the overall cost street maintenance for a municipality due to less deterioration of the pavement and will reduce flood clean up costs, but there is a cost associated with maintenance of the systems. Future maintenance should be considered during the design and construction of the drainage facilities. Maintenance is provided so that the facilities can function according to the original design and constructed and to maximize service life.

All designs shall meet the requirements for the current National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit for the city mandates a schedule for inspection and cleaning of the storm drain lines, inlets, catch basins, manholes, channels, pump stations and detention basins within the city.

The typical components for storm water system operation and maintenance include:

1. Routine periodic system inspection and assessment including videotaping for pipes.

2. Routine system cleaning. Catch basins, inlets, pipes, manholes and detention basins should be inspected and cleaned at a regular schedule and after major storm events where the design discharge has flowed through the system. Street sweeping can also be a method for reducing sediment flow into the system.

3. Minor system repairs and upgrades.

4. Preventative maintenance for landscaping

5. Customer Service for public complaint response and investigation.

6. Emergency Response/Unscheduled operation procedures.

Detention Basins

All of the NPDES guidelines should be followed. Detention and retention basins should have a cursory 'spot-check' at least annually and after design storm events. Complete detailed inspection should occur every 5 years to confirm design intent is being met and conditions at the facility have not changed enough to warrant any type of rehabilitation. The function of the basin, storage capacity and the adequacy of inlets and outlets should be reviewed to ensure the basin is still meeting the needs of the project. Changes in land use upstream of the basin could affect the function of the basin.

Frequent maintenance includes vegetation management, weed control, irrigation system maintenance, debris removal from inlets and outlets, multi-use area cleaning. Annual type of maintenance would include any needed vegetation replacement, re-seeding, erosion repair, signage replacement, pedestrian lighting, and removal of sediment accumulation. Basins should also be inspected for problems such as graffiti, vandalism or

standing water. Provisions should be made for permanent drainage facility accessibility for maintenance equipment.

Storm Drains

Storm drains and all of their components should be inspected every five years. . Inspection can be done by visual inspection or videotaping with an engineering review. Spot checks from manholes should occur every 3 years. Conduits that could be subject to extensive wear on the invert or have heavy debris or sediment flow might need to be inspected more often.

Frequent maintenance would include catch basin cleaning and street sweeping. Annual types of maintenance would include manhole and storm drain pipe cleaning if required.

Storm drains have a life expectancy of 25- to 100-years and will need to be repaired during, or replaced after the useful life has been reached. Periodically, storm drains become inadequate due to increased development creates additional runoff which cannot be contained by the storm drain.

Open Channels

Open channels and their components should be inspected once every five years. Inspection should include a channel walk through, inspecting the invert, and any channel walls or banks. Cursory or spot-check inspections should occur every three years.

Maintenance items include removing deleterious vegetation not in the design of the structure, removal of sediment accumulation, and erosion protection for banks, inverts, and road crossings.

11.1 Design Features to Facilitate Maintenance

The following are design features that will promote effective operation and maintenance with the least cost.

1. Storm drain shall have a minimum distance between manholes based upon the size of the storm drain as set forth in City of Glendale Standards. At no time shall the maximum distance between manholes exceed 660 feet.

2. The typical manhole width shall be five (5) feet in diameter to promote effective maintenance of the system.

3. Minimum cleanout velocities shall be strictly adhered to in all design. Minimum velocities shall be shown in a half-full condition for all storm drains.

4. Accumulated sediment and debris in basin should be removed from the basin.

5. Access to basin must be available for equipment to maintain basins.

5. Access to basin must be available for equipment to maintain basins.

6. Basins should be encompassed within a City owned property or right-of-way.

7. Multi-use features of basins should be above those areas that receive the most frequent inundation.

8. Multi-use basins should have internal drainage to eliminate nuisance ponding on upper tiers of basins.

9. Maintain funding for operation and maintenance.

10. Future cost share agreements should include an estimate of ongoing operation and maintenance for the life of the structure. Provisions for scheduled and unscheduled maintenance should be identified.

11.2 Maintenance Funding Mechanisms

Costs for new or replacement of existing facilities are normally programmed into the capital improvement programs (CIP) for the city. Maintenance of the stormwater conveyance facilities is not included in the CIP and therefore must be funded through other measures. Currently, storm drain maintenance must come out of the General Fund budget and must compete with all other requests for street maintenance.

A separate storm drain utility has been discussed over the years but never implemented due to resistance to increase the tax burden to the public. Development impact fees have been imposed on new developments to help pay for parks, libraries etc which helps provide facilities due to the increased development. A fee such as this could be used for stormwater facility maintenance in the future.

There are several funding mechanisms which could be used to help pay for stormwater facility maintenance. These include:

- Place a development impact fee for stormwater facility maintenance.
- Add a surcharge to the current water/sewer bill to pay for stormwater facility maintenance.
- Increase the sales and/or property tax to cover the cost for stormwater facility maintenance.
- Create a separate storm drain utility to help fund new stormwater facility construction as well as maintain existing facilities.

11.3 Maintenance Accounting

To facilitate an understanding of the cost of operation and maintenance of the storm water facilities, an accounting system can be established so the cost of each major maintenance item can be logged and reviewed. Common stormwater maintenance tasks can be listed so each task can be charged. Common tasks would include:

- Erosion/Basin Slope Repair
- Cleaning or repair of Energy dissipation structure
- Basin inlet or outlet cleaning
- Basin vegetation trimming or removal
- Catch basin/inlet cleaning
- Storm drain cleaning
- Storm drain repair
- Manhole repair or installation

This data can be tabulated so future costs for operation and maintenance of the storm drain system can be accurately identified by existing. Cost of man power and equipment can be totaled, then a true operation and maintenance cost can be recognized.

12.0 Conceptual Design Plans

GLENDALE AREA STORMWATER MANAGMENT PLAN

CITY OF GLENDALE

RECOMMENDED CONCEPT PLANS

LEGEND

- PROPOSED STORM DRAIN
- PROPOSED DETENTION/ RETENTION BASIN
- EXIST. DETENTION/ RETENTION BASIN
- S — EXIST. SANITARY SEWER
- W — EXIST. WATER MAIN
- EXIST. STORM DRAIN
- EXIST. IRRIGATION LINE
- PROPOSED AT-GRADE CROSSING
- PROPOSED STORM DRAIN CATCH BASIN
- Ⓢ PROPOSED STORM DRAIN MANHOLE

GLENDALE

CITY COUNCIL
MAYOR
ELAINE M. SCRUGGS

CITY COUNCIL MEMBERS
STEVEN FRATE
YVONNE J. KNAACK
PHIL LIEBERMAN
MANNY MARTINEZ
DAVID GOULET
JOYCE CLARK

NOTES

1. THESE PLANS ARE FOR PLANNING PURPOSES ONLY. NOT FOR CONSTRUCTION.
2. ALL PARCEL AND RIGHT-OF-WAY INFORMATION WERE OBTAINED FROM THE CITY.
3. ALL WATER MAIN, SANITARY SEWER, AND STORM DRAIN UTILITY LOCATIONS WERE OBTAINED FROM THE CITY. ALL WATER MAIN DEPTHS WERE ASSUMED TO BE 4 FEET FROM THE EXISTING GROUND ELEVATION. THE LOCATIONS OF ALL STRUCTURES AND UTILITIES MUST BE FIELD VERIFIED. FURTHER SURVEY INFORMATION REQUIRED TO IDENTIFY POTENTIAL CROSSING CONLICT LOCATIONS.
4. ALL IRRIGATION UTILITY LOCATIONS WERE OBTAINED FROM THE SRP ZANJERO MAPS. THE INFORMATION WAS GATHERED TO SHOW AN APPROXIMATE LOCATION OF THE IRRIGATION UTILITY. PIPE SIZE WAS NOT DETERMINED.
5. ALL AERIAL IMAGERY WAS OBTAINED FROM THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY AND CONTAIN FLIGHT DATES BETWEEN OCTOBER 2008 AND DECEMBER 2008
6. THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

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DRAWN BY: ZRS
CHECKED BY: DEJ
DATE: 07/12/2011

GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE RECOMMENDED PLANS
COVER SHEET

PROJECT NO. 09191009

DRAWING NAME COVER SHEET

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SHEETS
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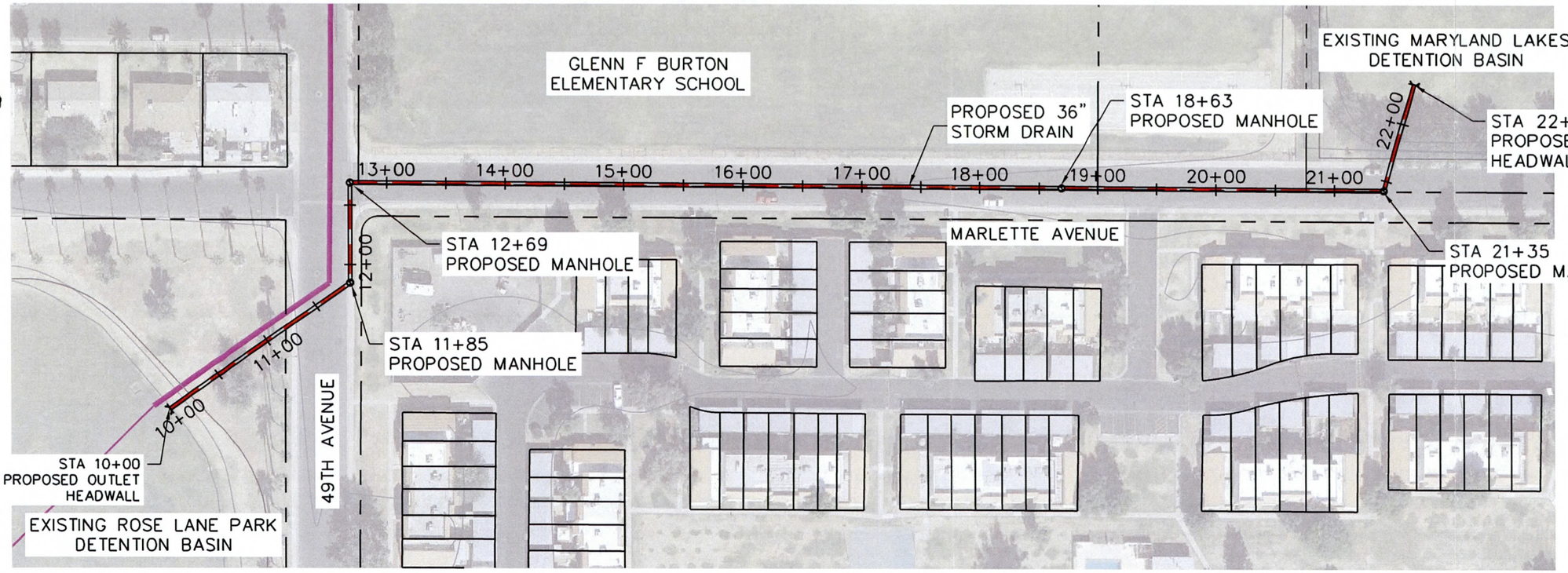

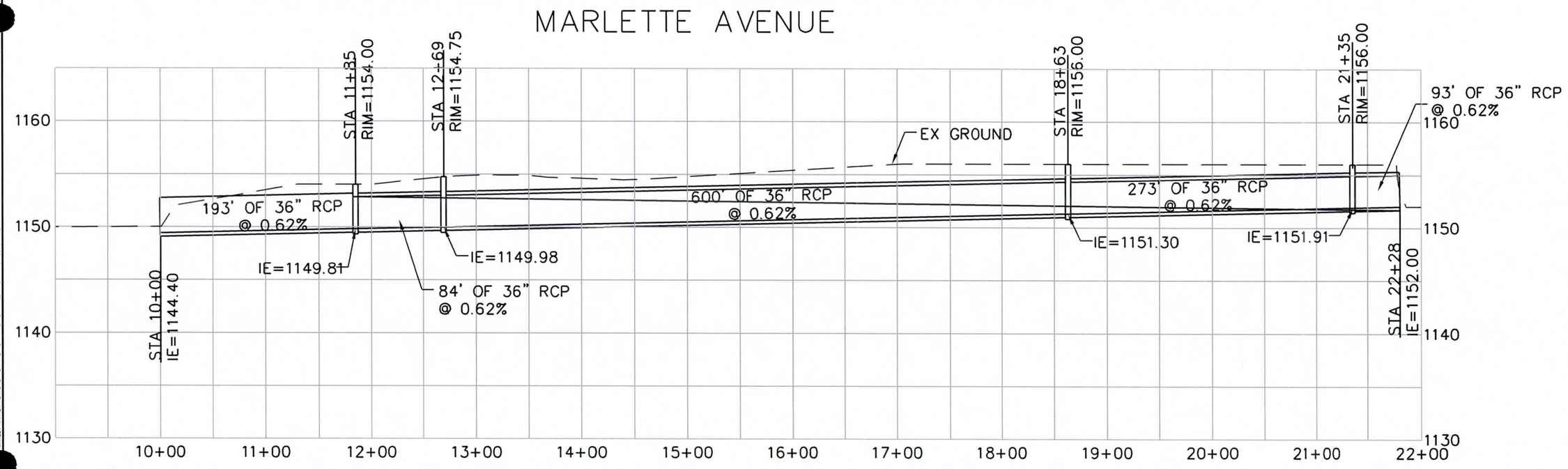

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
ADOT BASIN

PROJECT NO.
09191009

DRAWING NAME
091910009PR01

BETHANY HOME ROAD

EXISTING MOBILE HOME PARK

6:1 SIDE SLOPES

PROPOSED 6 FOOT DEEP DETENTION BASIN
APPROXIMATELY 16 AC FT

6:1 SIDE SLOPES

24+00

23+00

22+00

21+00

20+00

PROPOSED INLET STRUCTURE

PROPOSED 2-48" STORM DRAIN
SEE SHEET 5

EXISTING VACANT LOT

CONNECT TO EXISTING BASIN WITH PROPOSED EQUALIZER PIPE

EXISTING MOBILE HOME PARK

EXISTING ROSE PARK LANE DETENTION BASIN

ROSE LANE

N

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
ADOT BASIN

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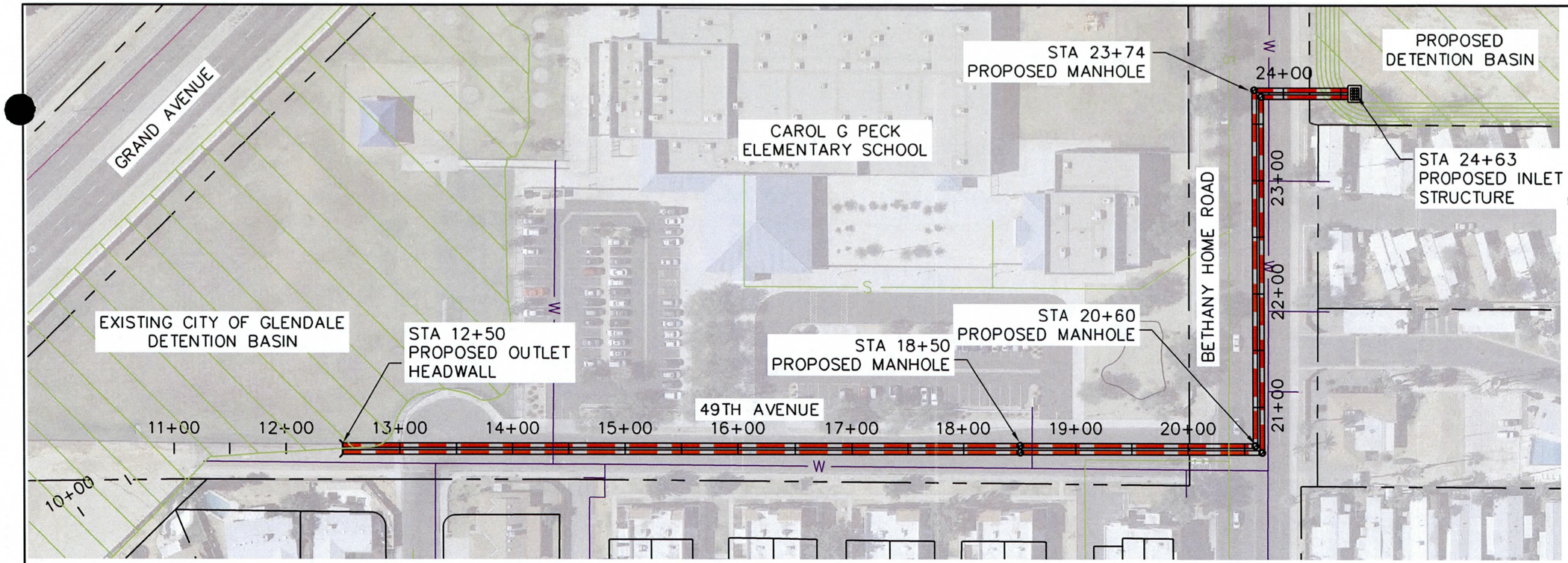
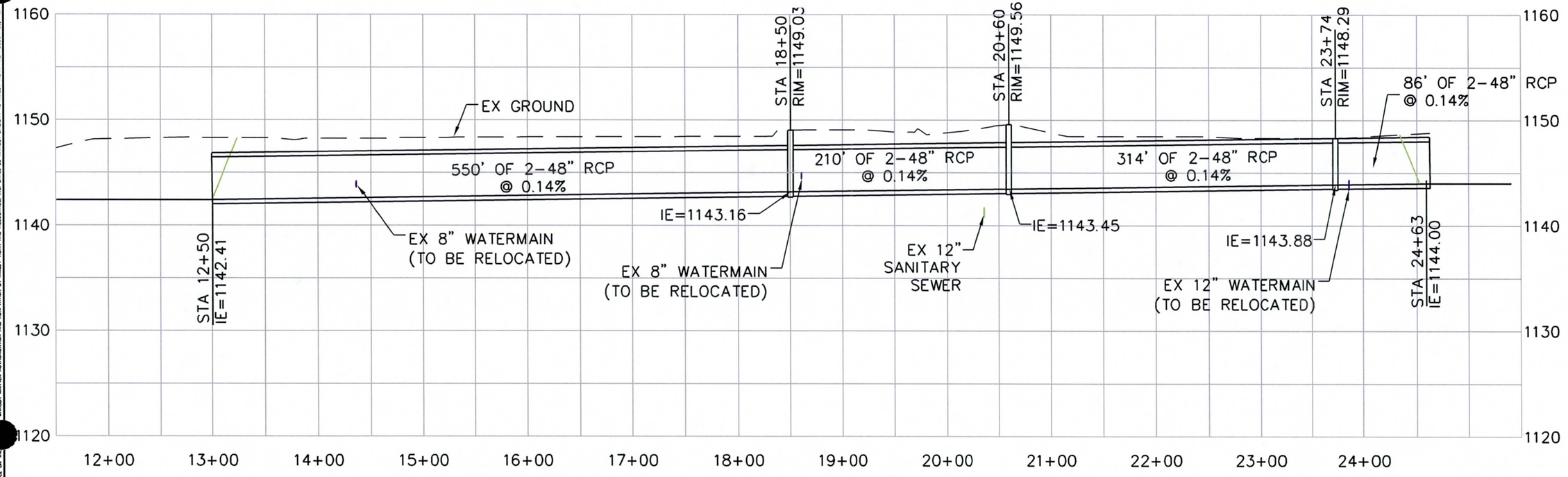


49TH AVENUE & BETHANY HOME ROAD



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CITY OF GLENDALE
RECOMMENDED PLANS
ADOT BASIN

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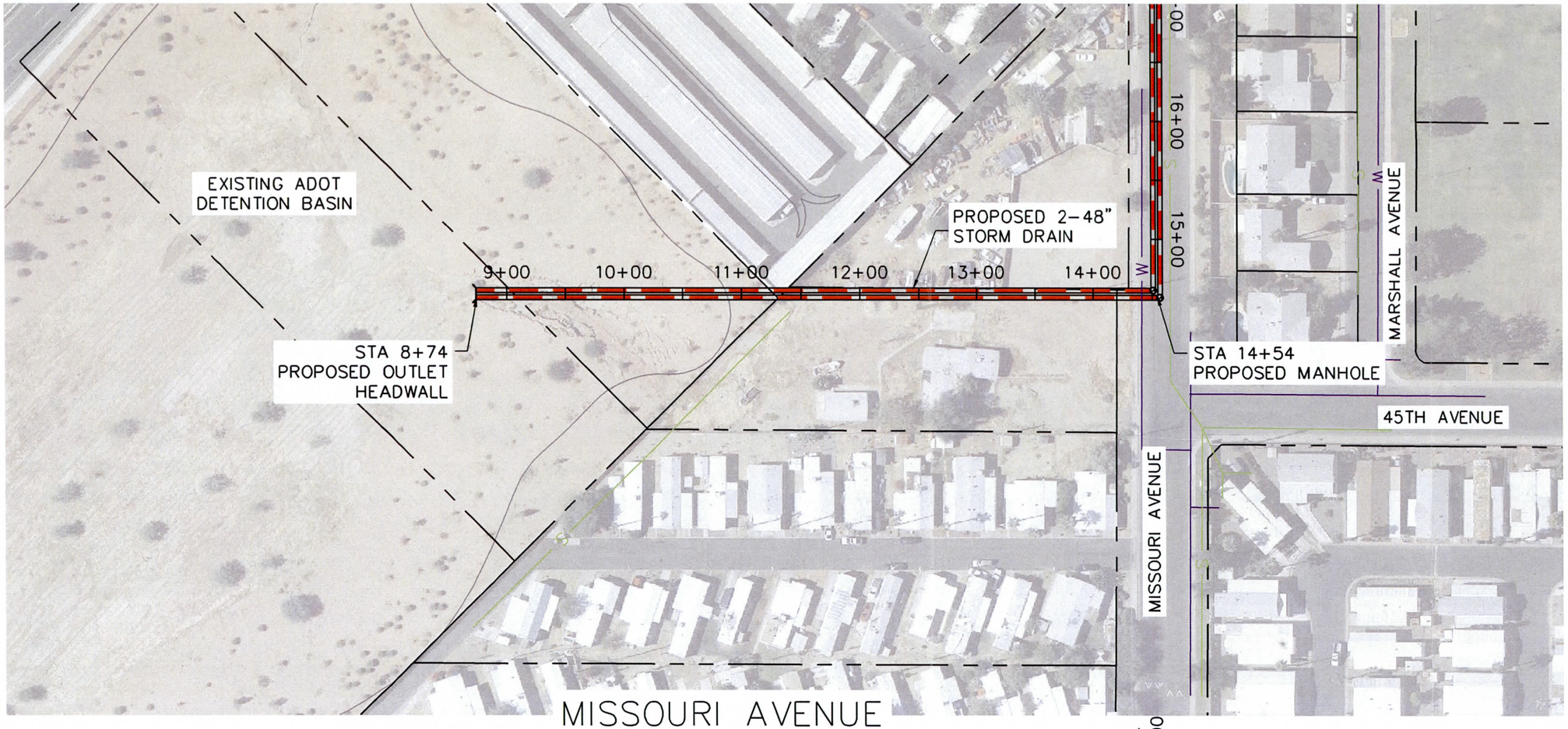

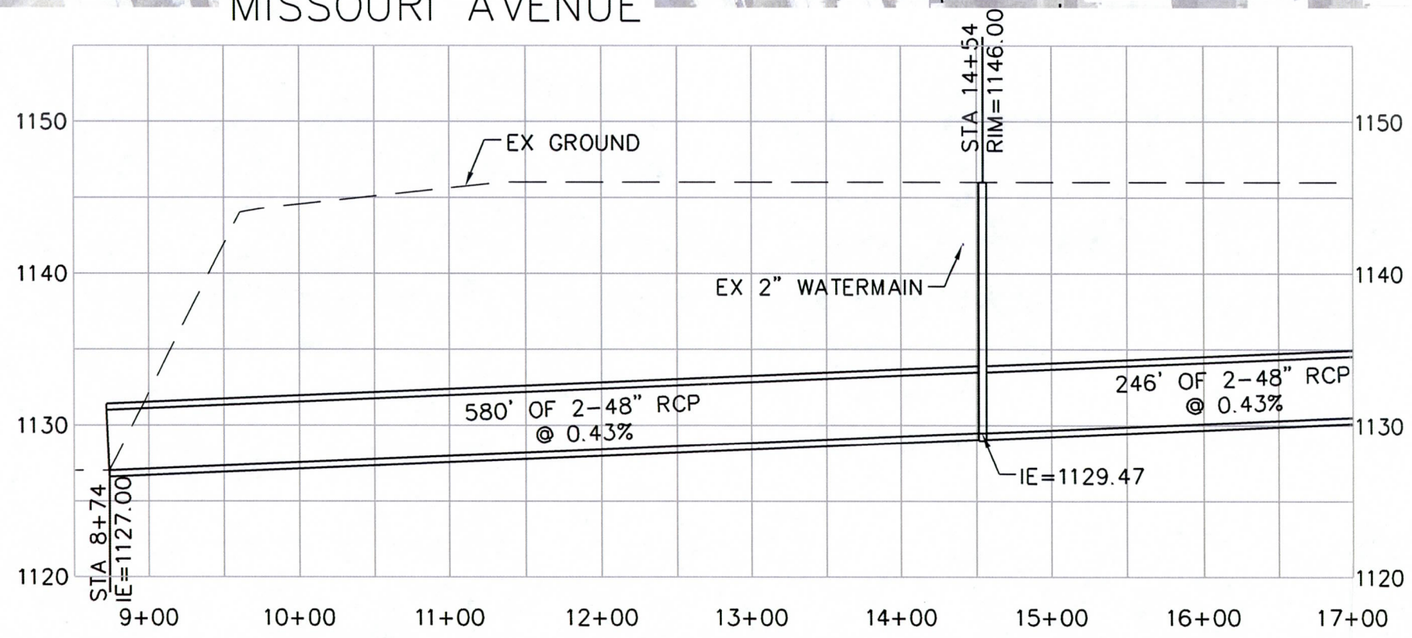

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CITY OF GLENDALE
RECOMMENDED PLANS
ADOT BASIN

PROJECT NO.
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DRAWING NAME
0919100009PR04

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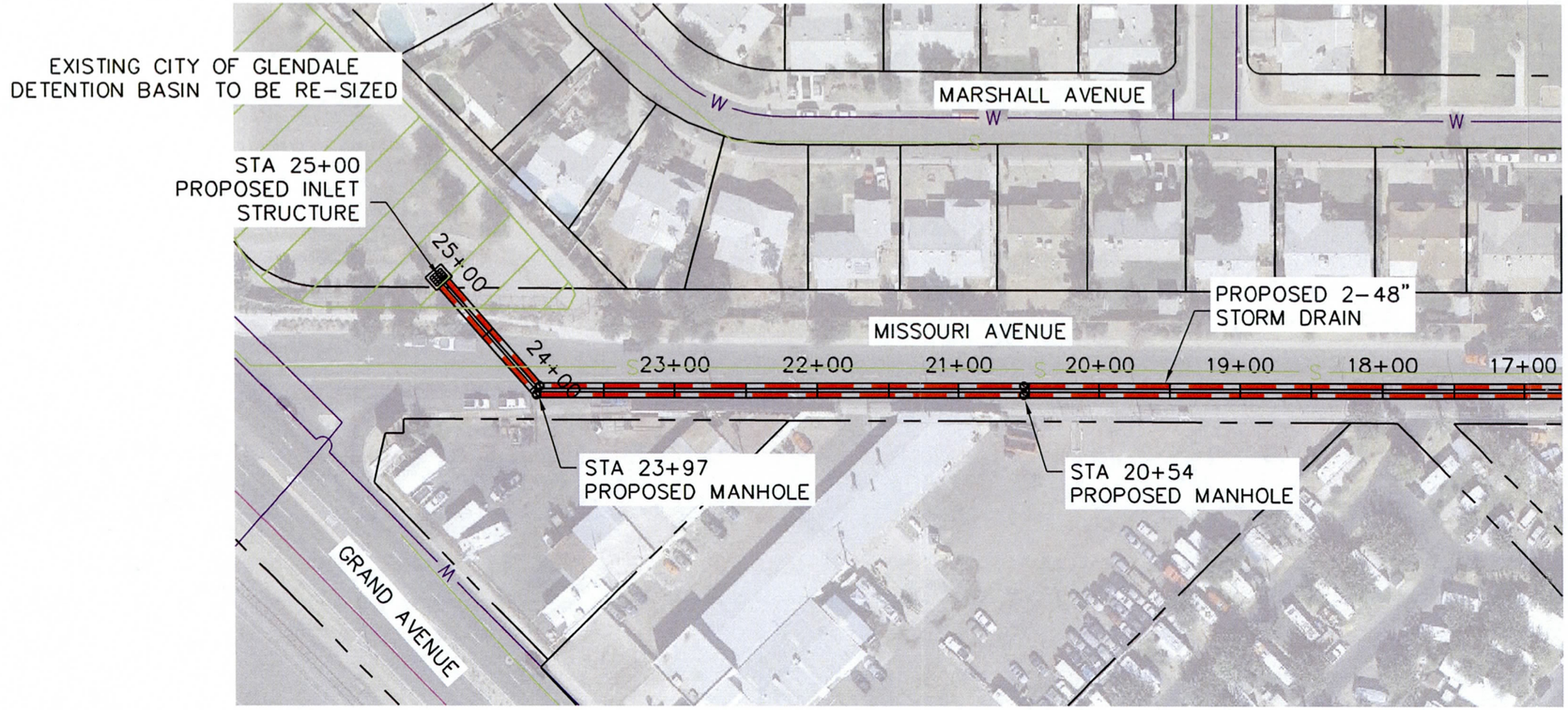

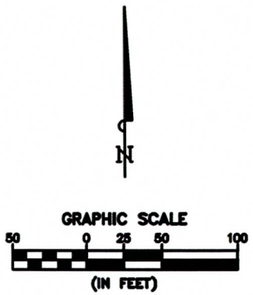

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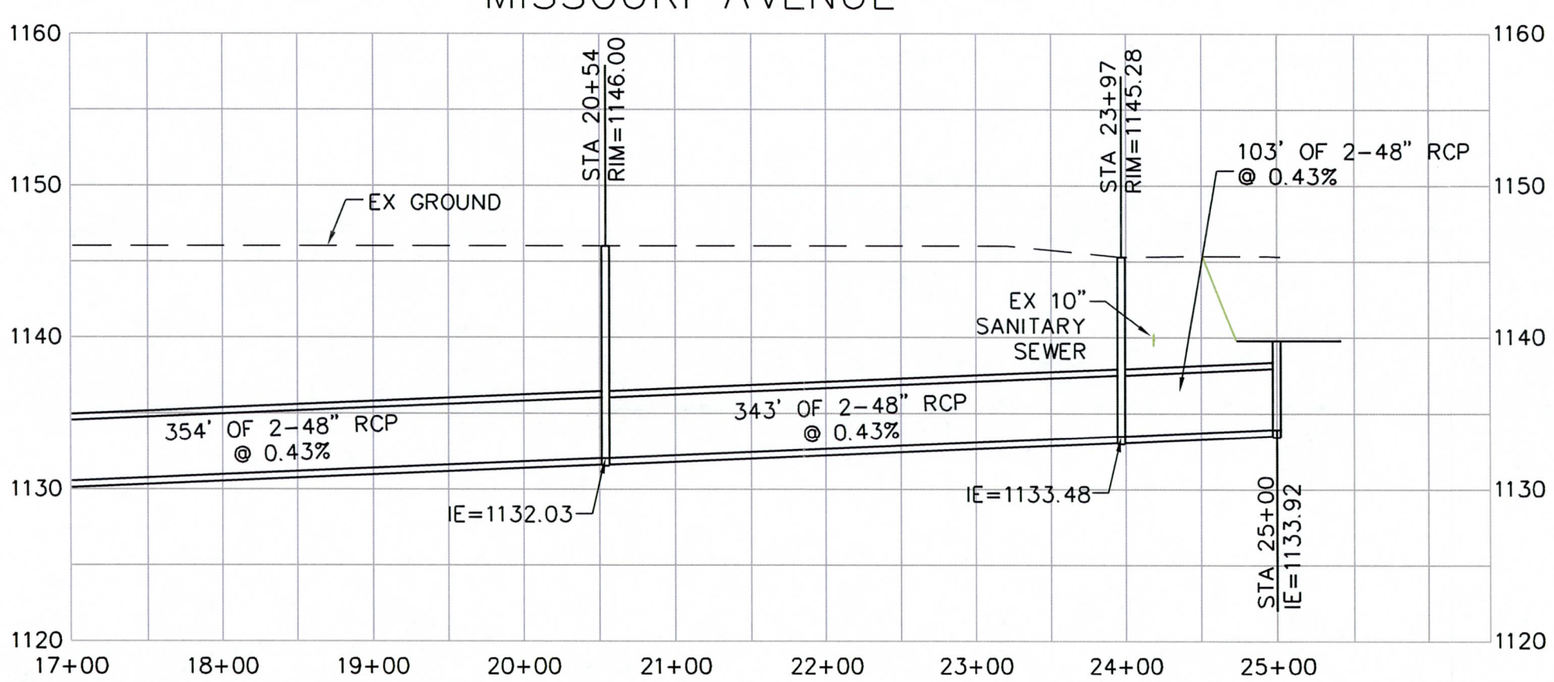

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DRAWN BY: ZRS
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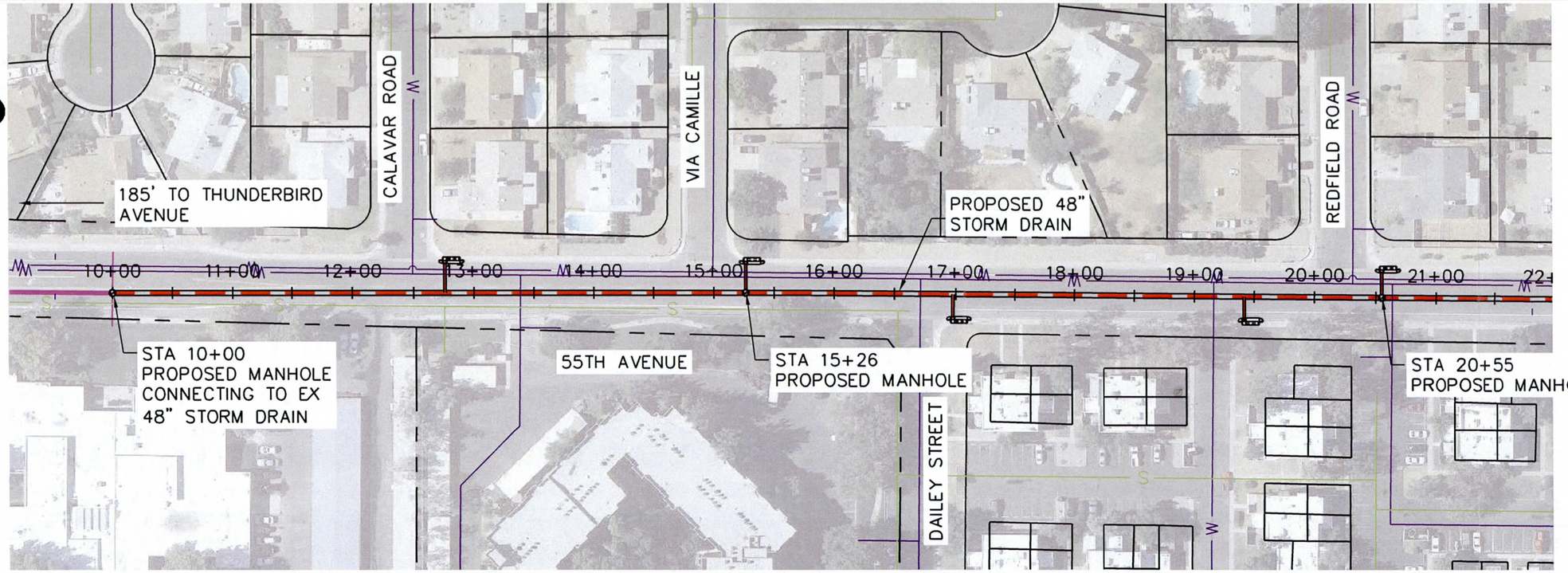
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
ADOT BASIN

PROJECT NO.
09191009

DRAWING NAME
091910009PR04



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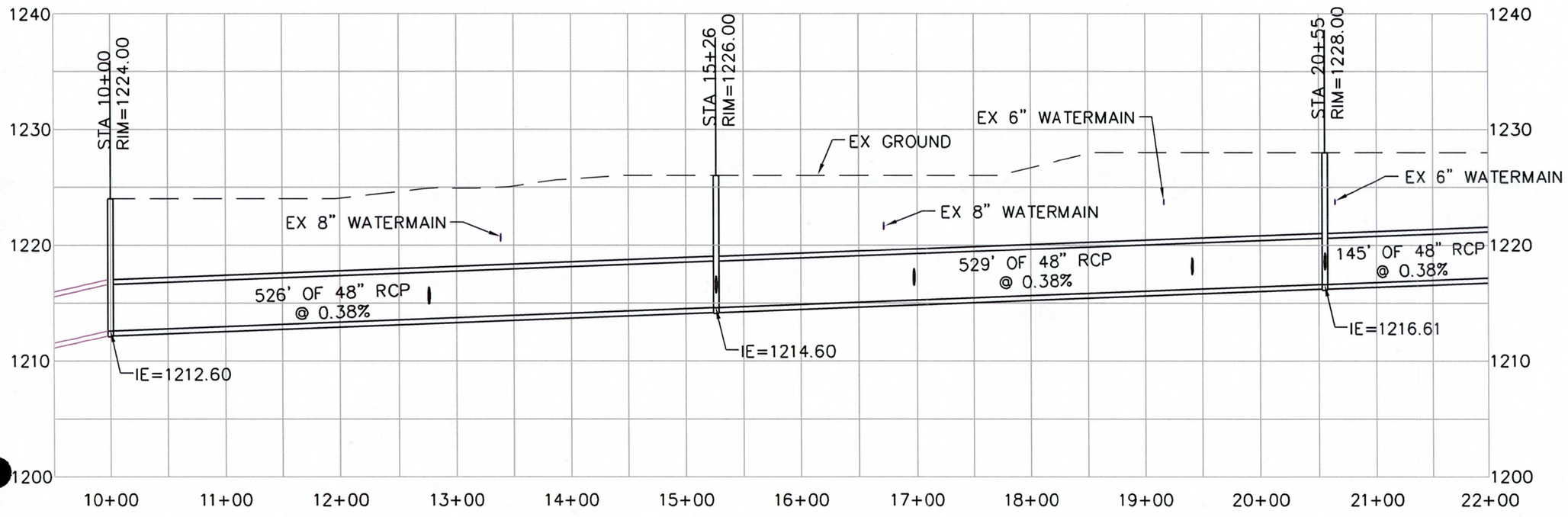

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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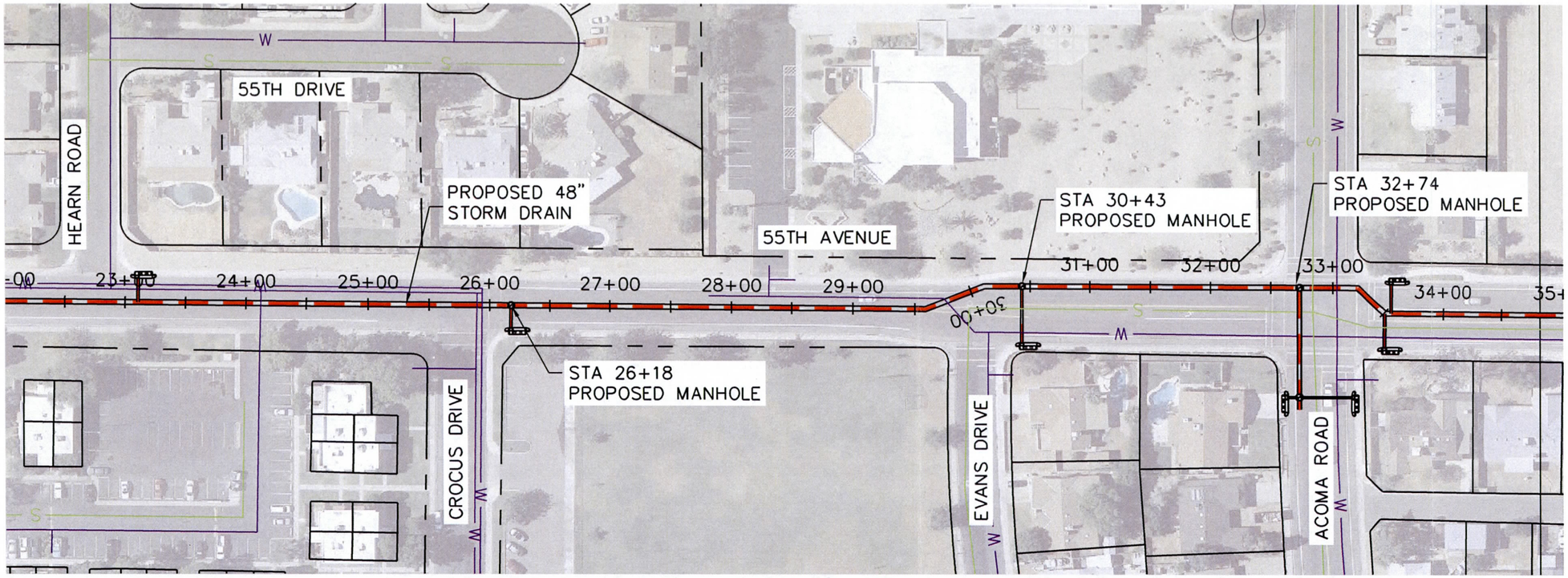

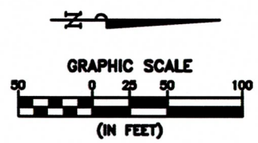

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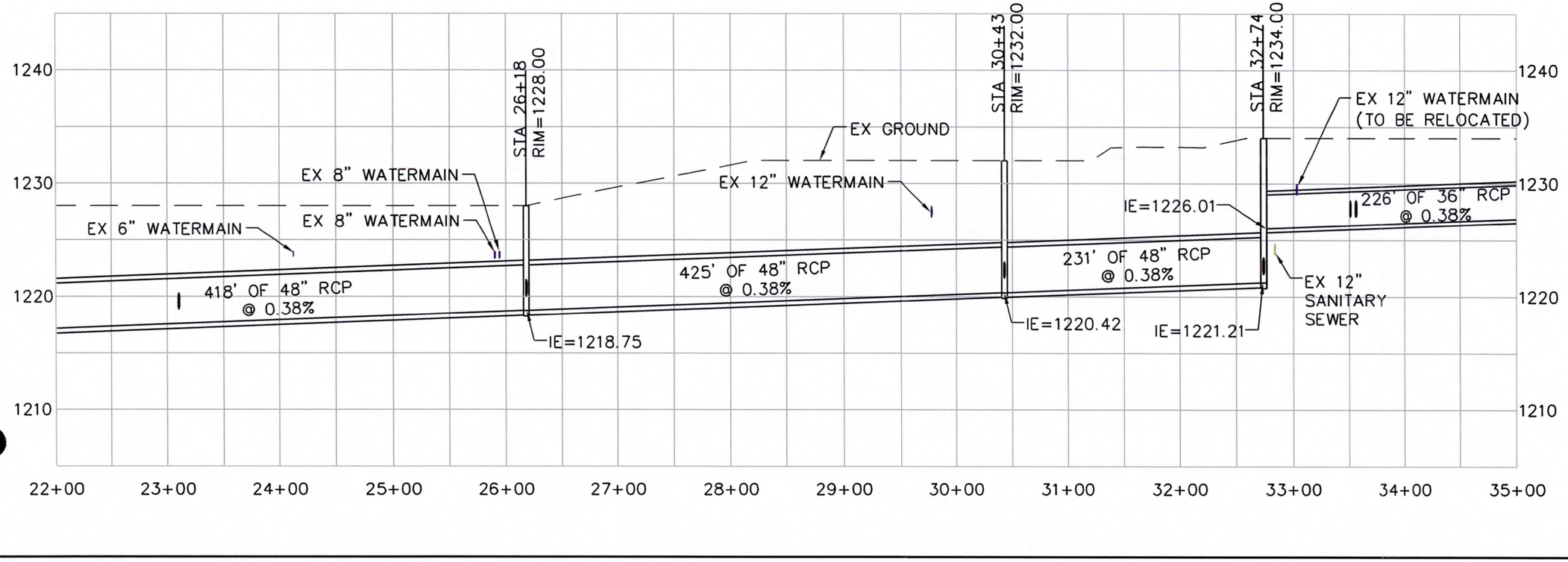

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CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

DRAWING NAME
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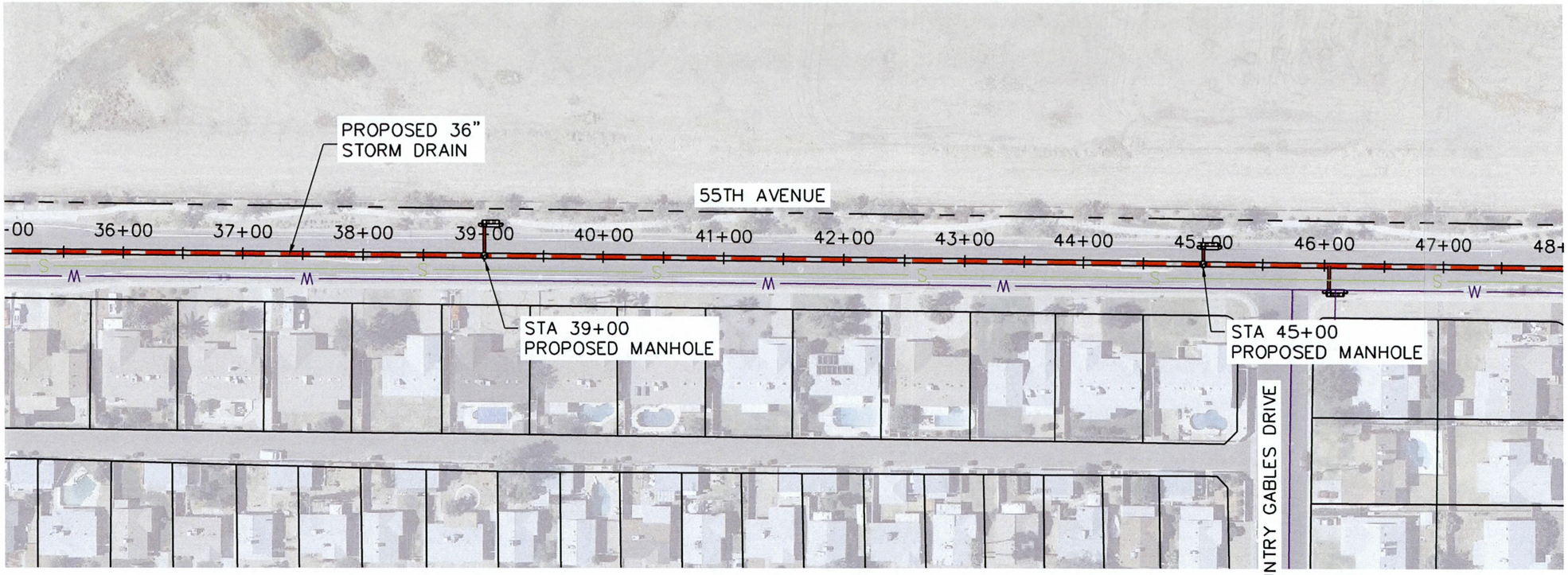

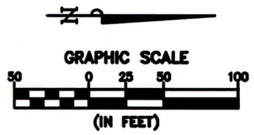

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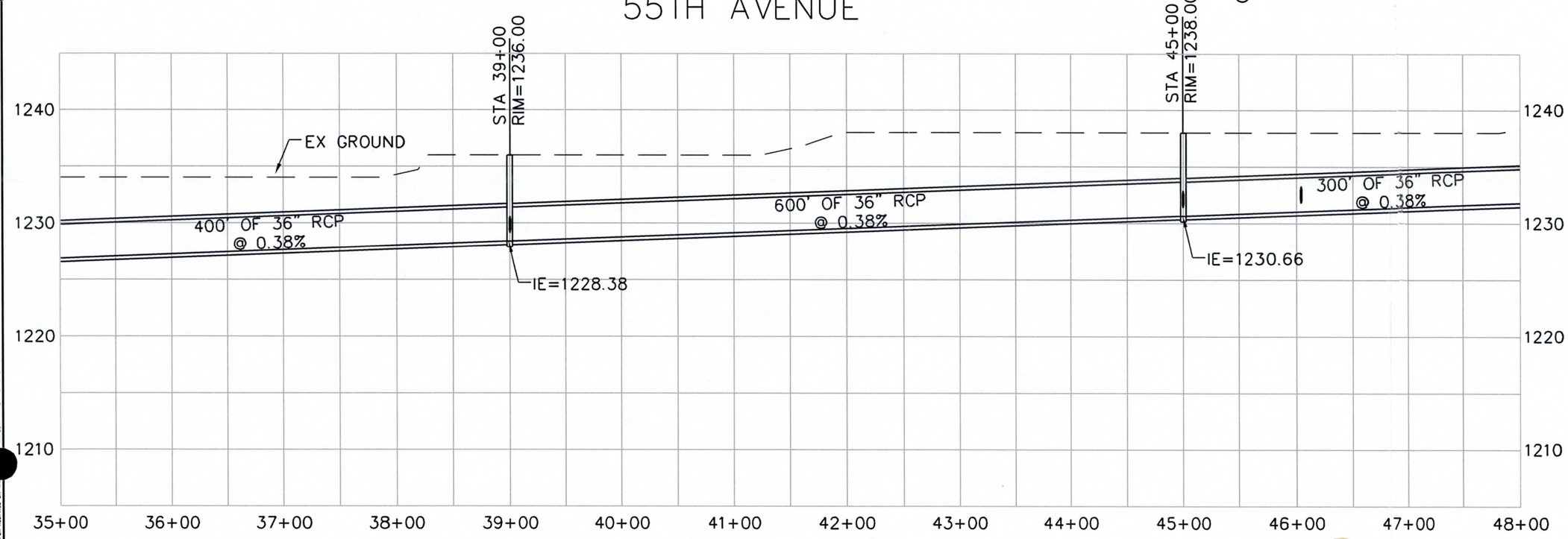

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CITY OF GLENDALE
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55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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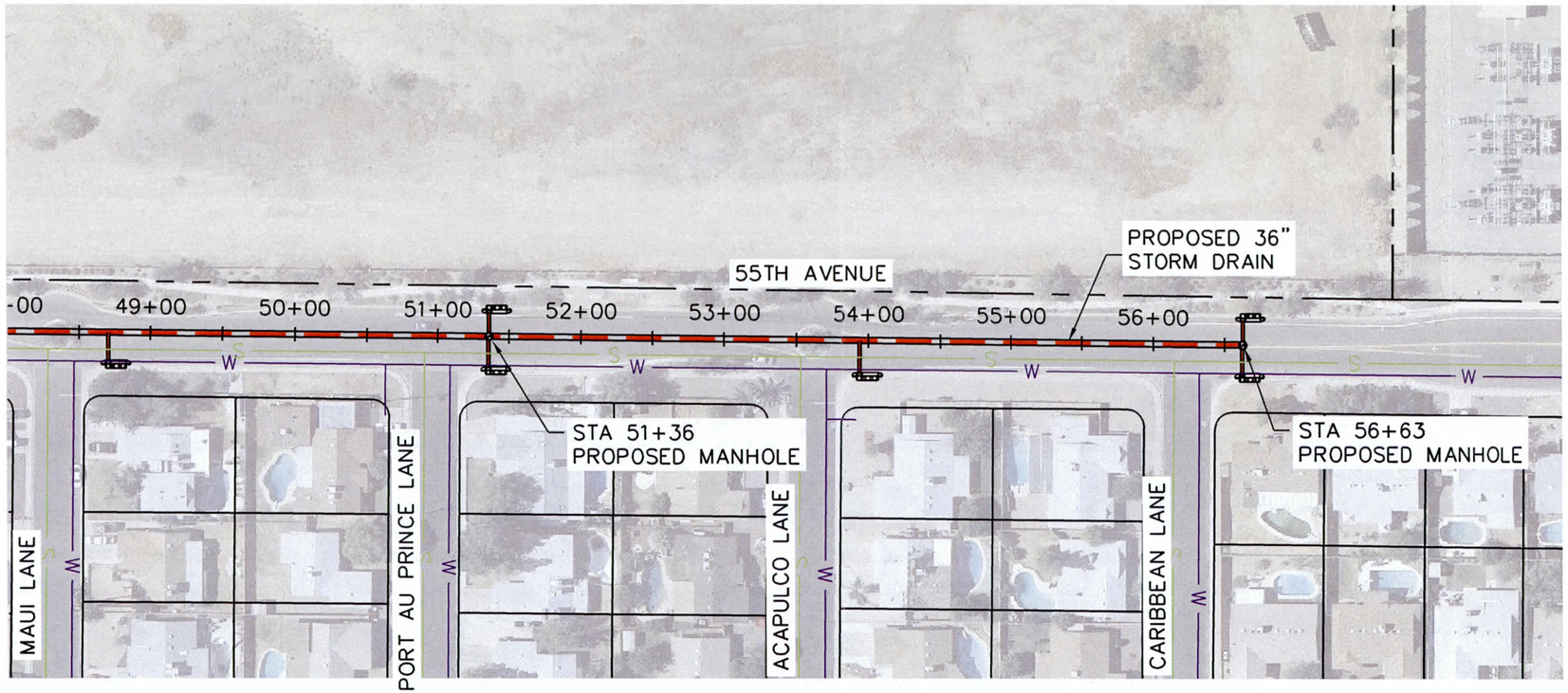

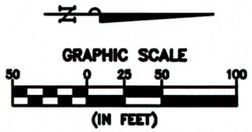

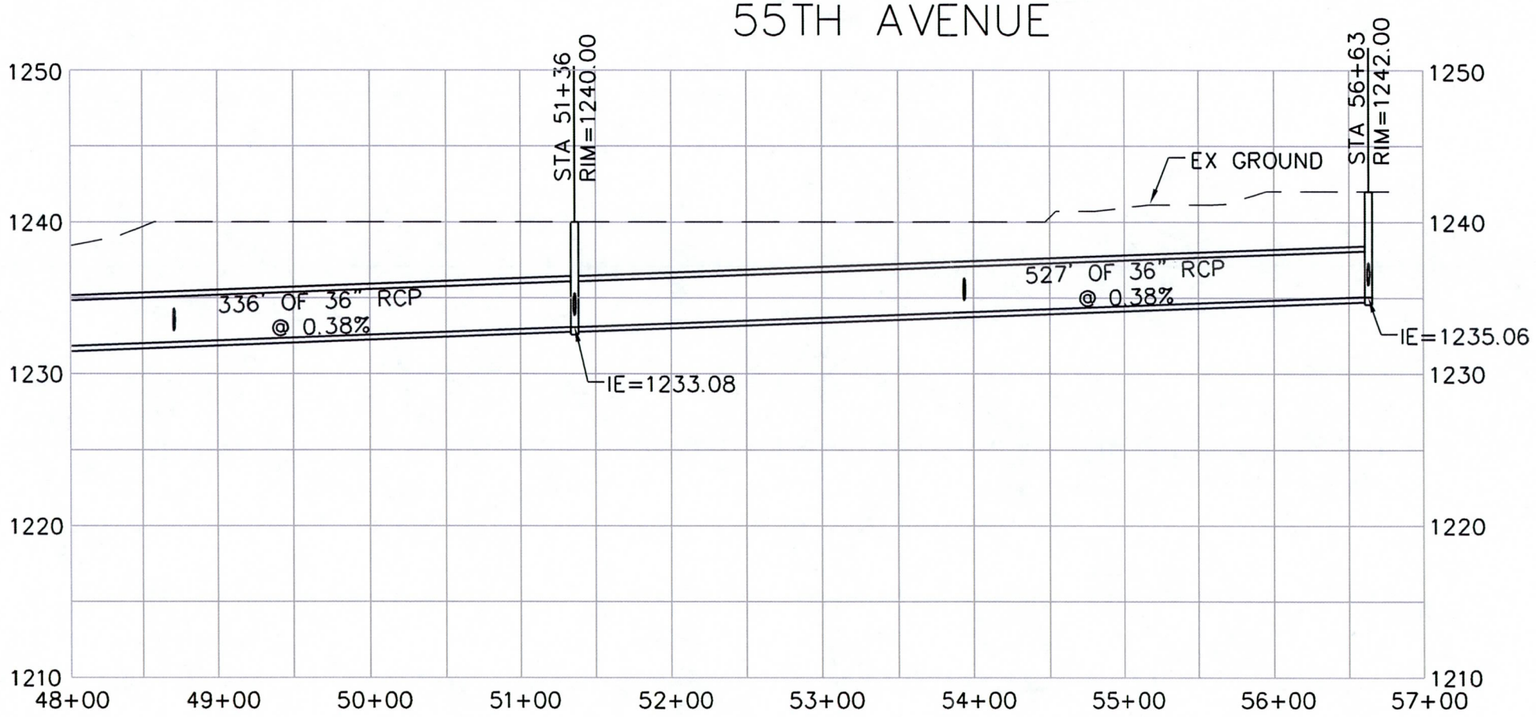

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CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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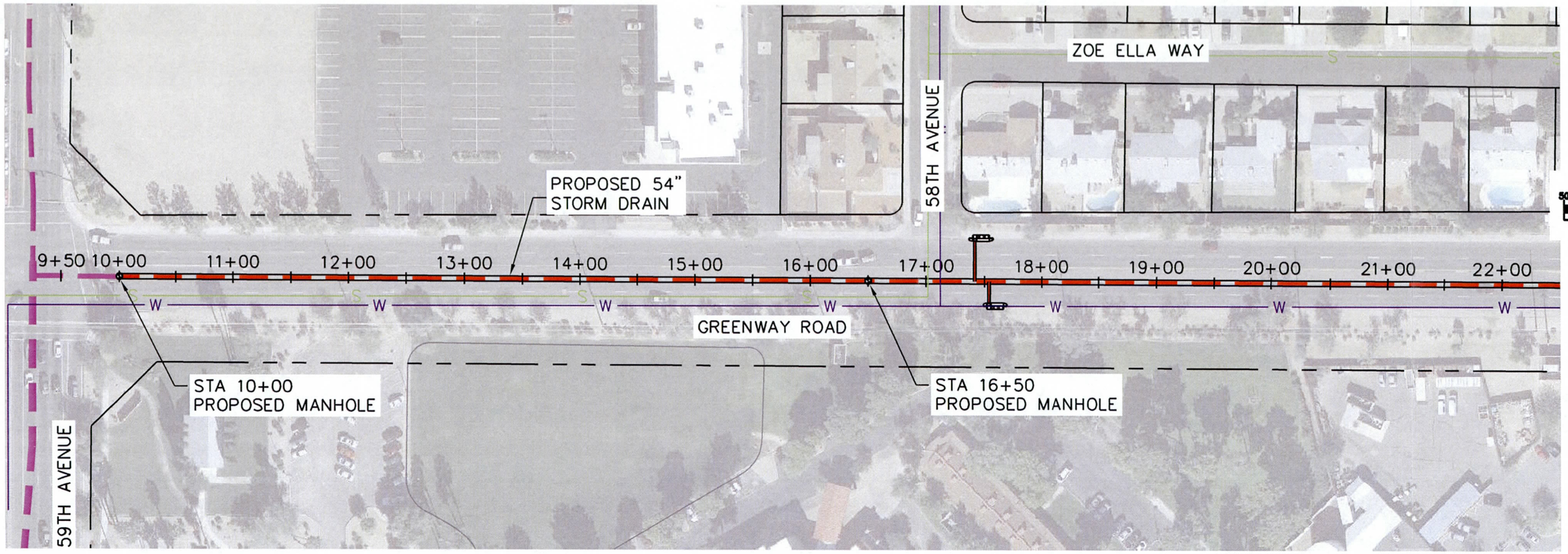

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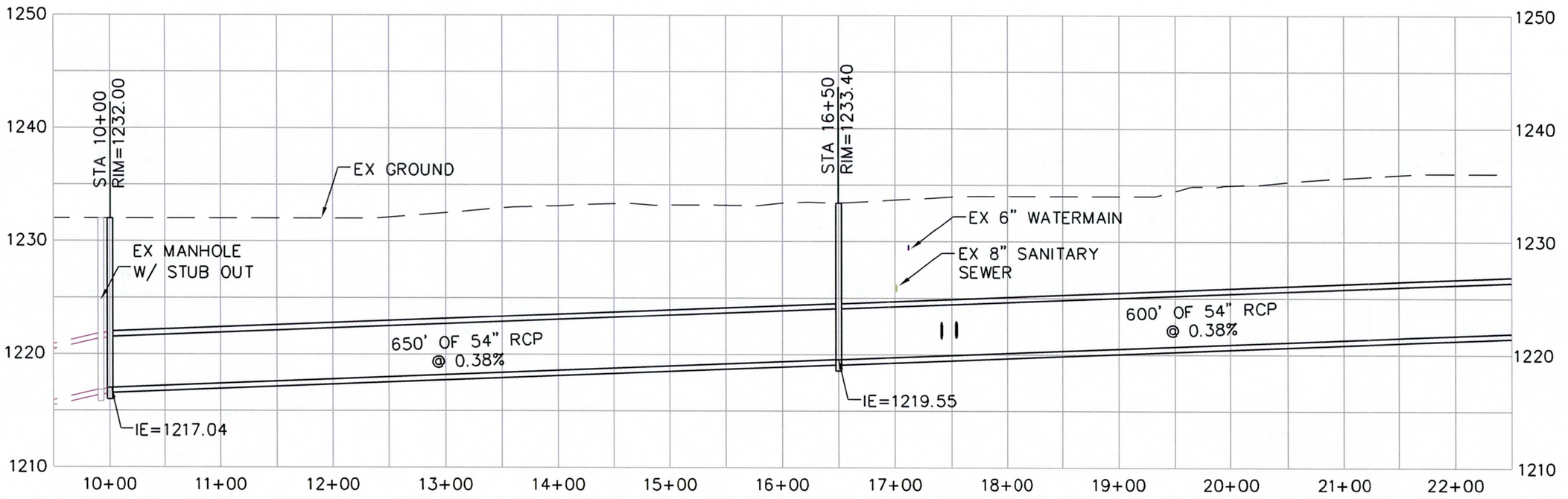

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE - NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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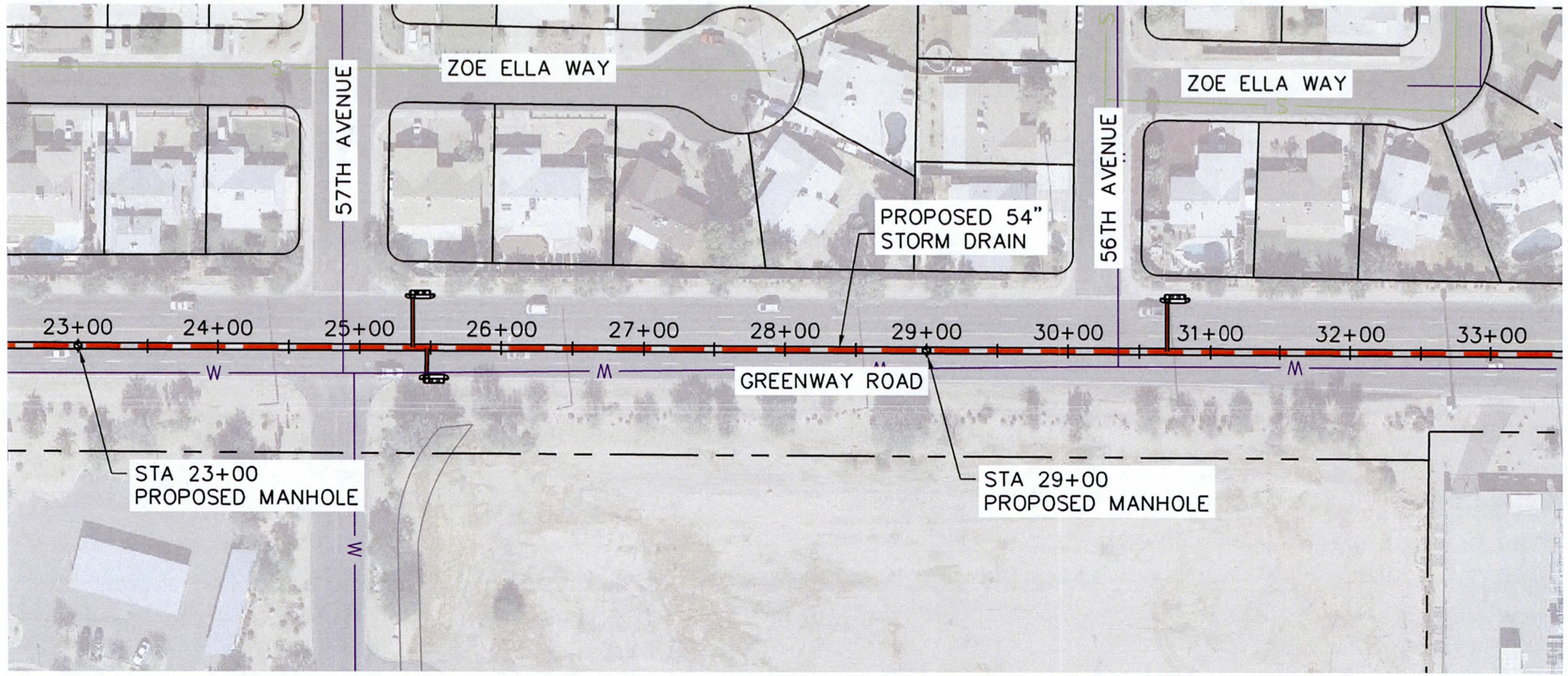

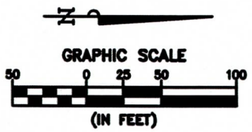

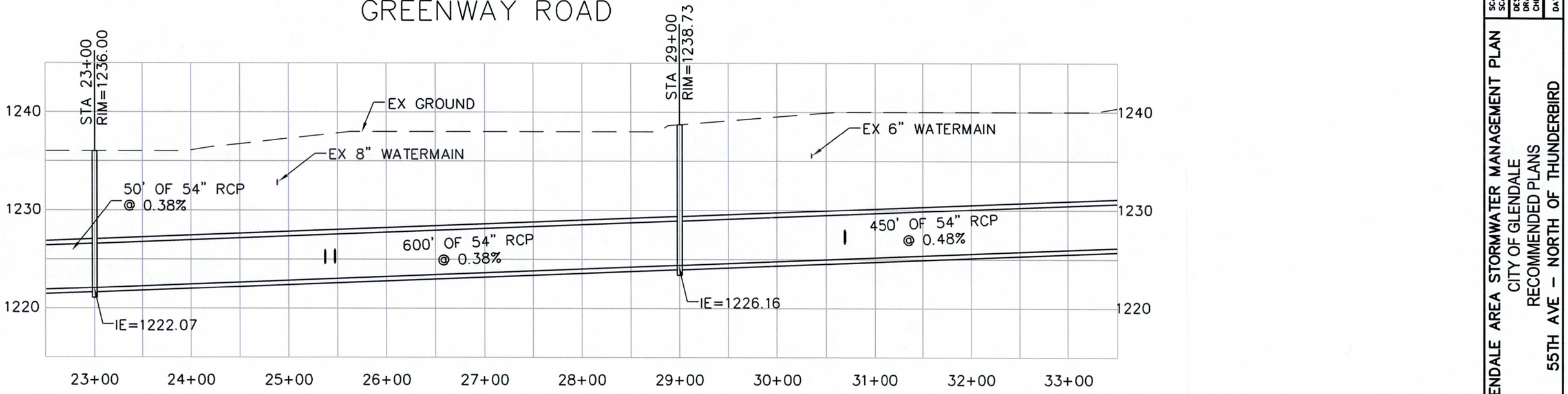

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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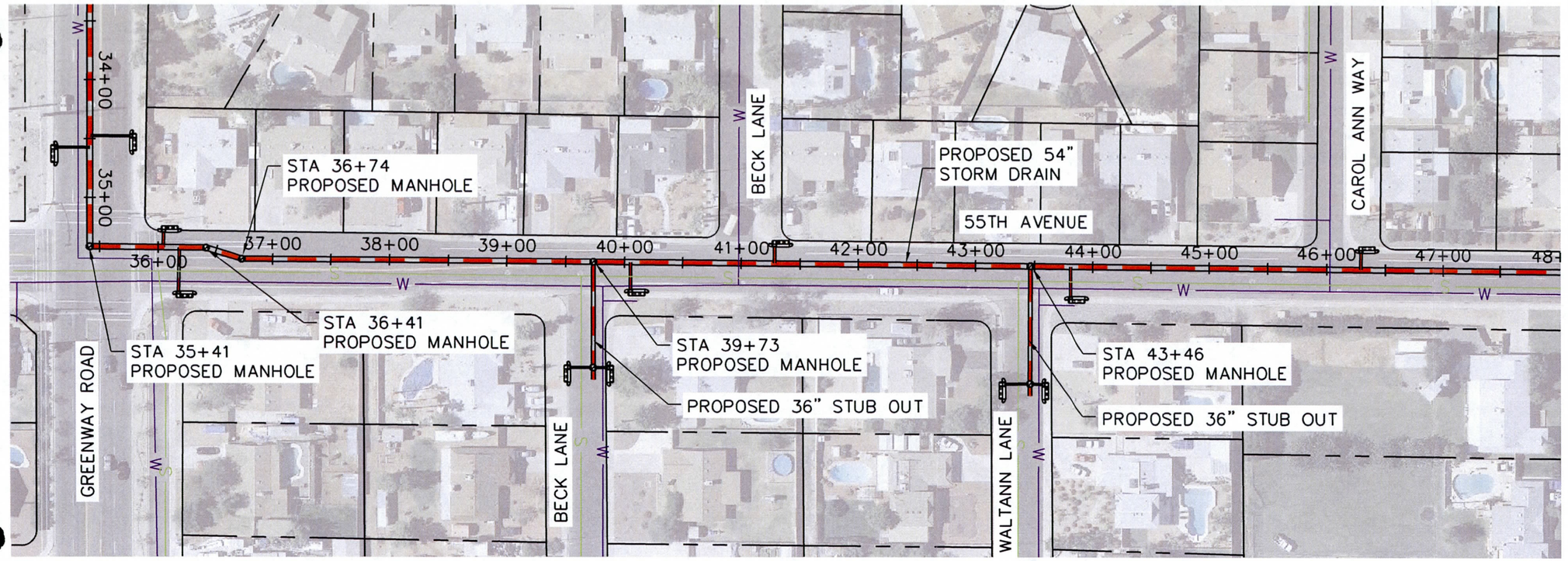

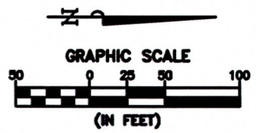

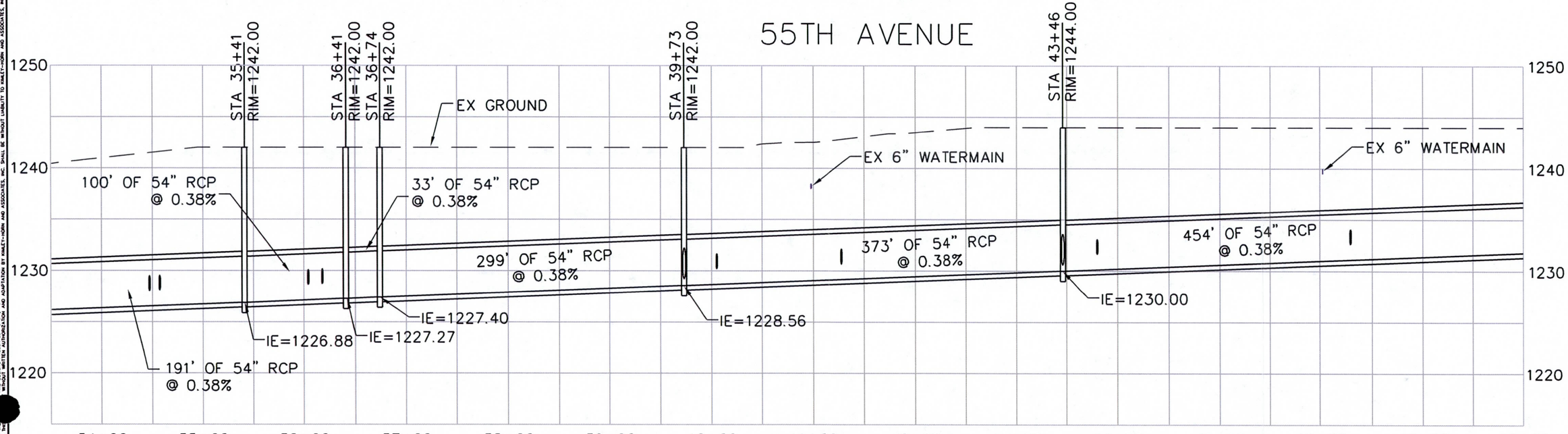

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CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

DRAWING NAME
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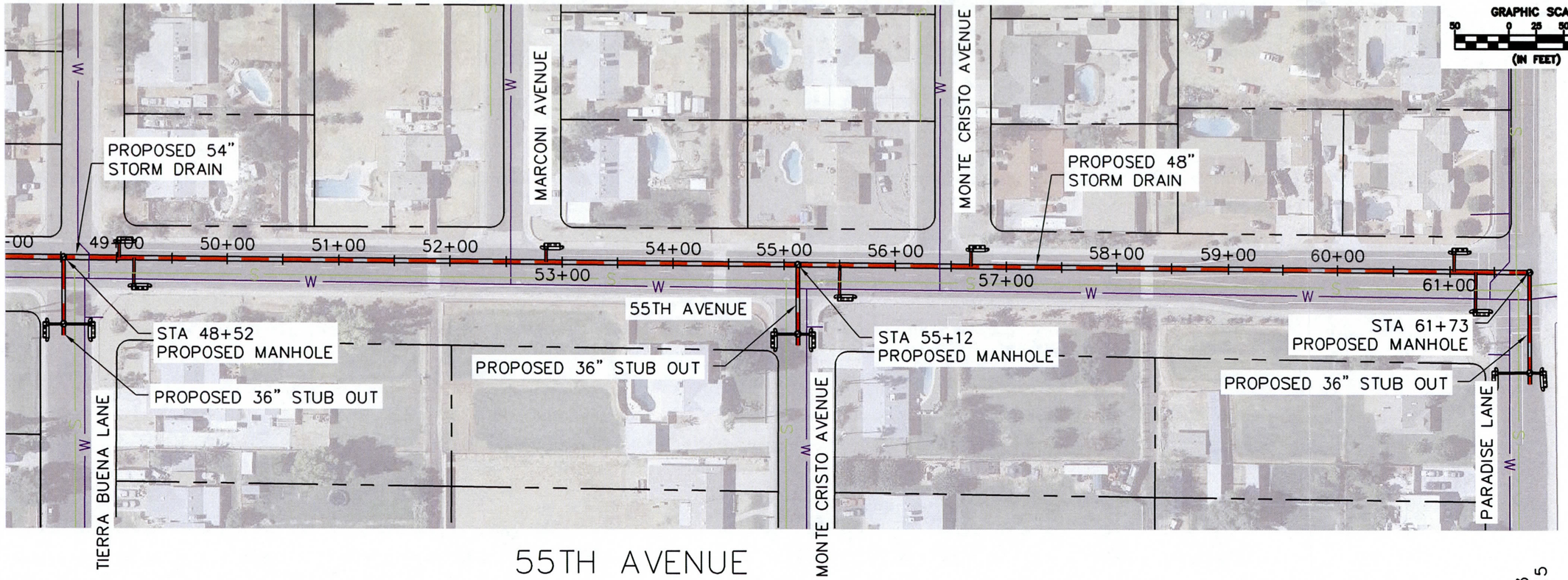

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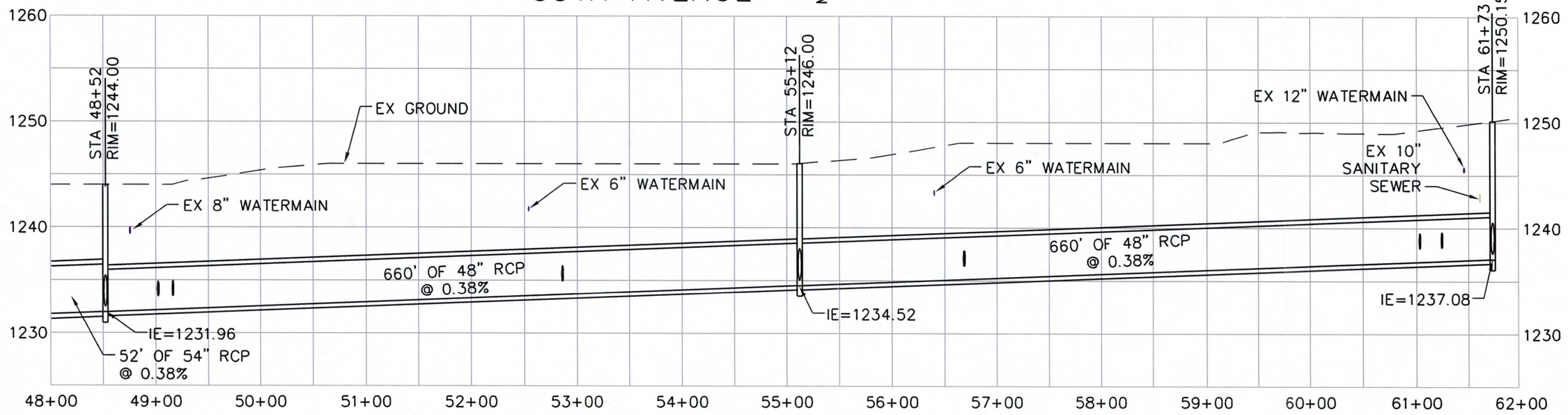

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVE – NORTH OF THUNDERBIRD

PROJECT NO.
09191009

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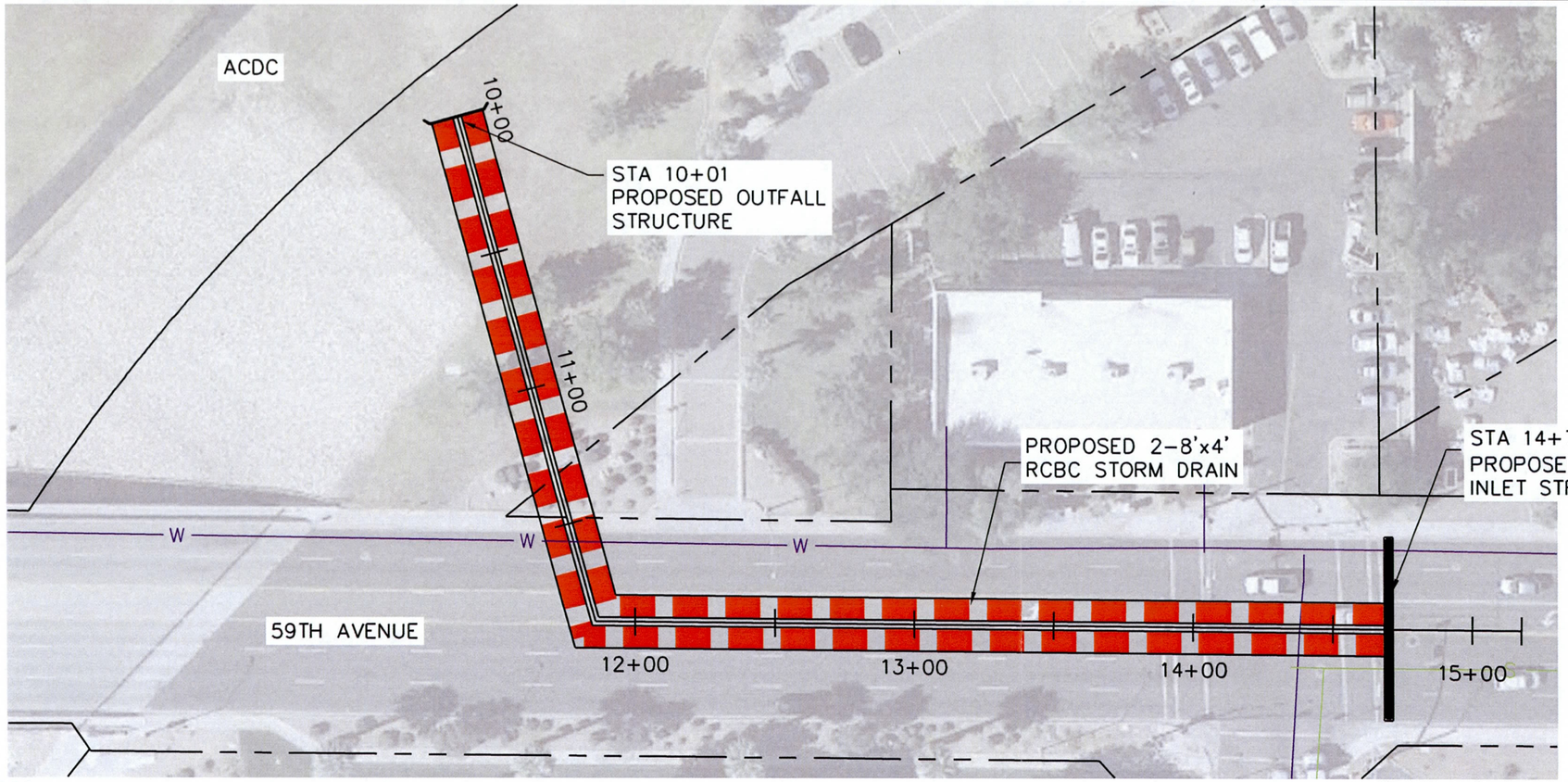

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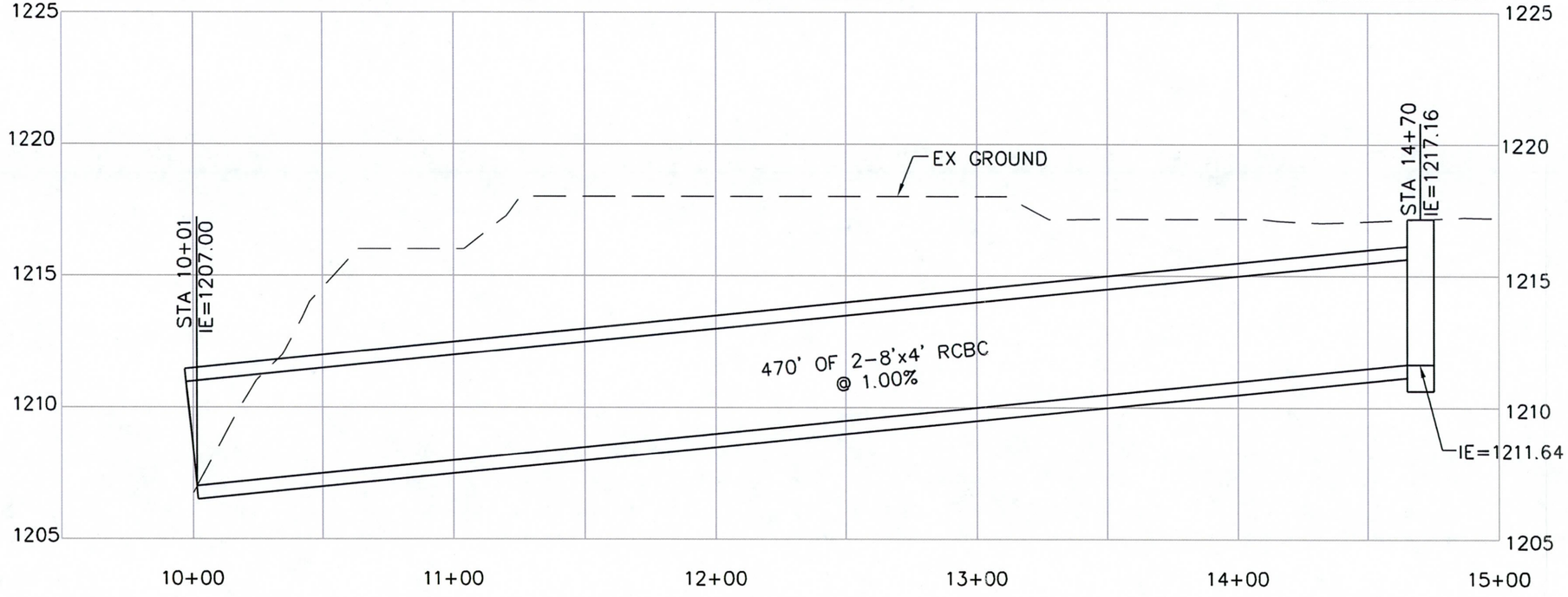
(IN FEET)



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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
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09191009

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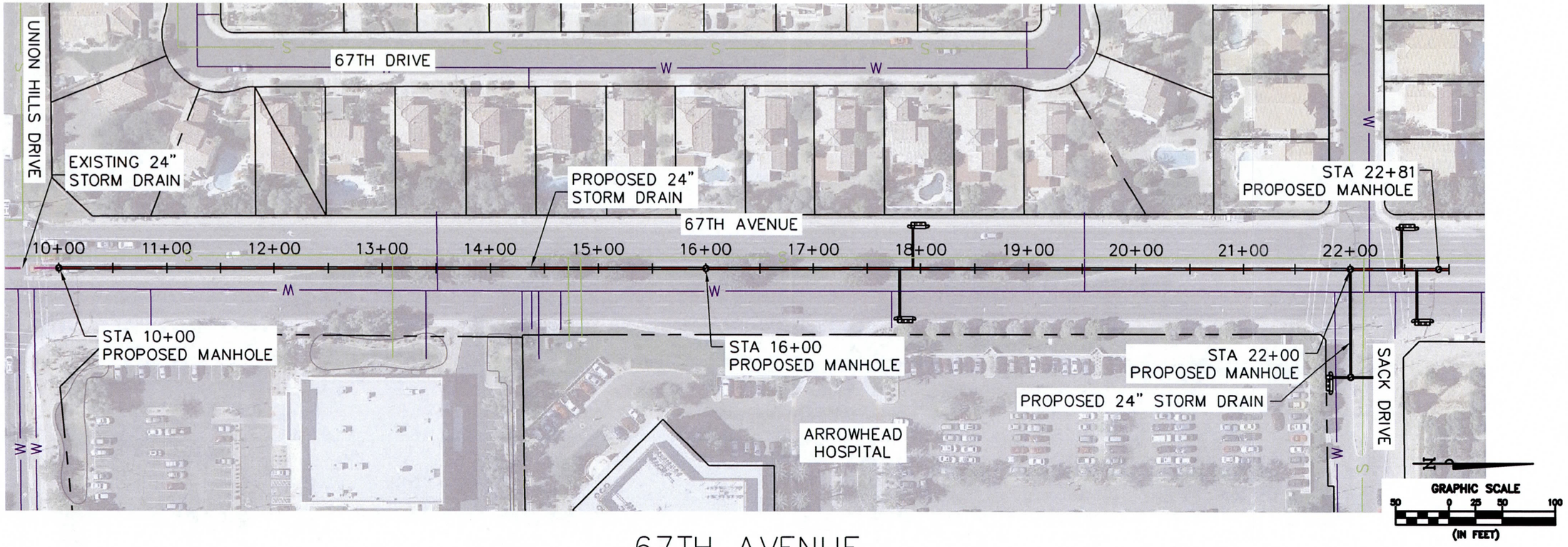

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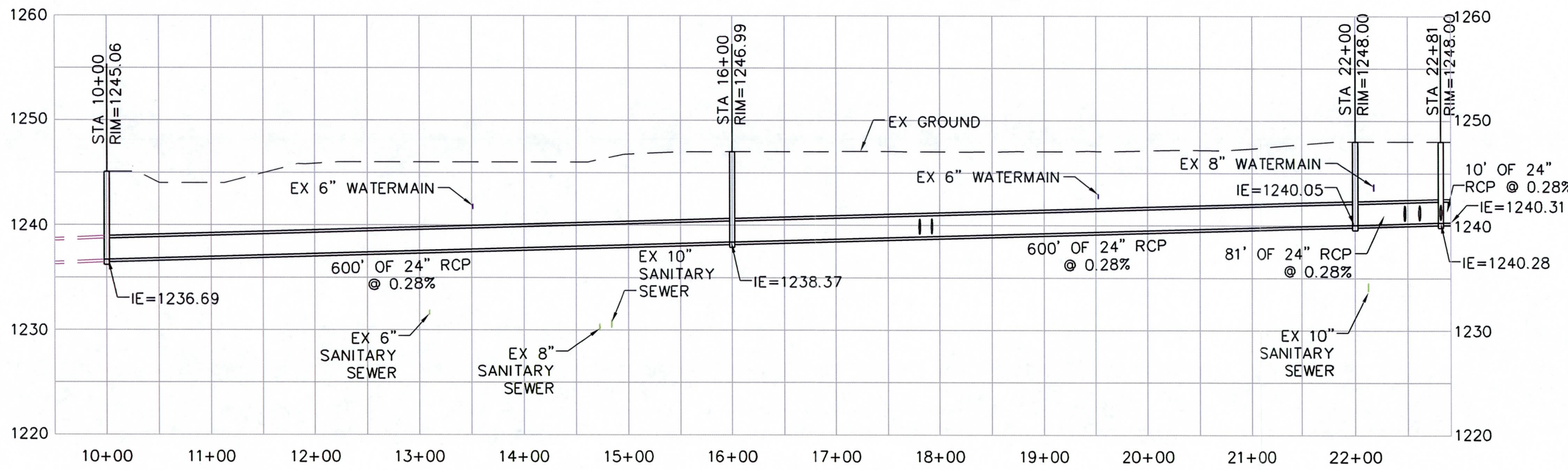

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
67TH AVENUE AND ARROWHEAD HOSPITAL

PROJECT NO.
09191009

DRAWING NAME
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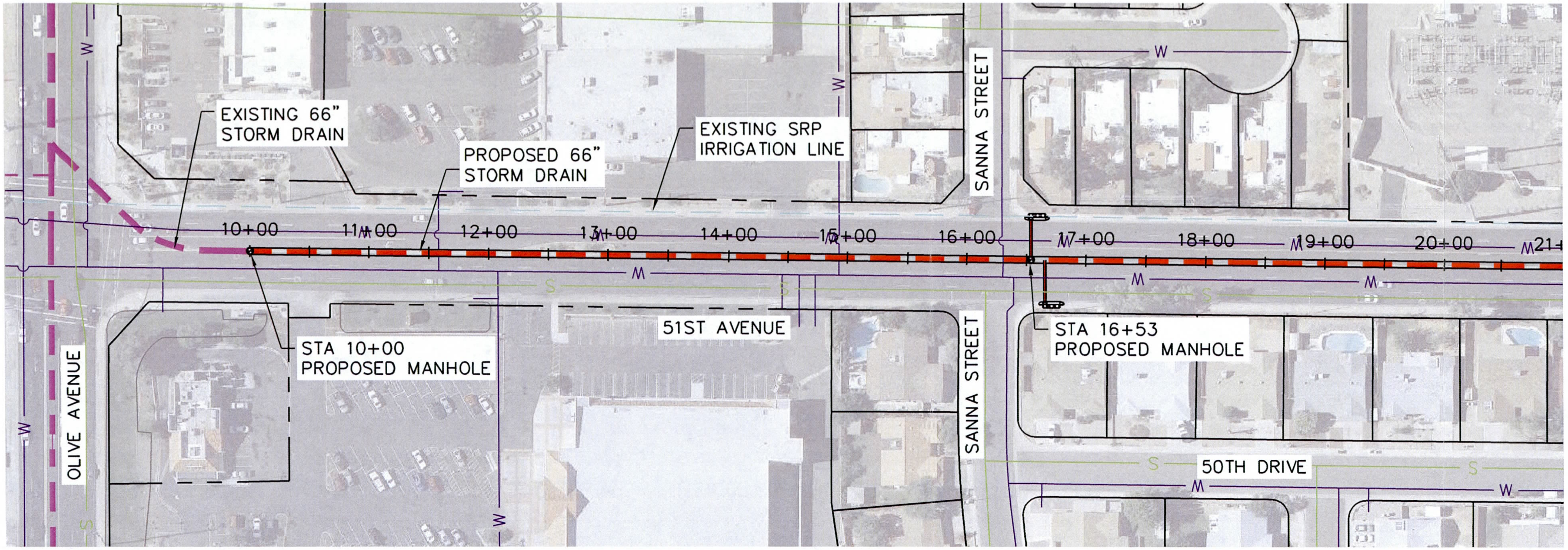
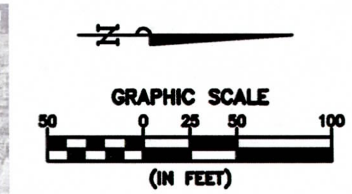
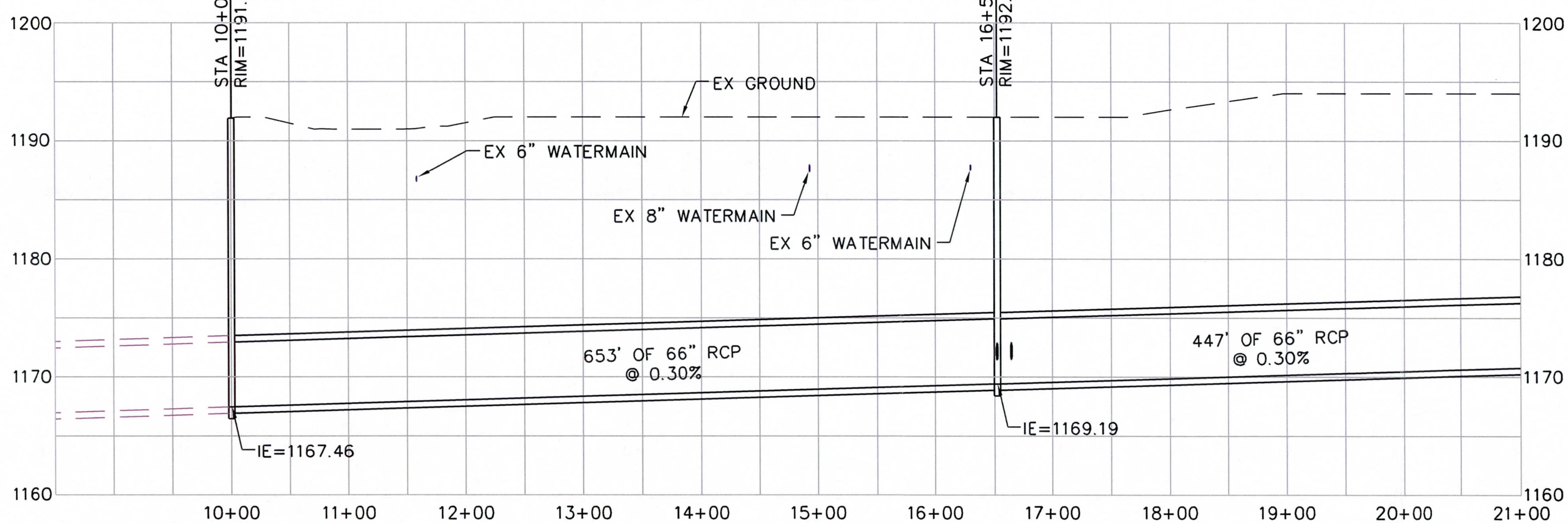




51ST AVENUE



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SCALE (V): NONE
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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO. 09191009

DRAWING NAME 091910009PR15

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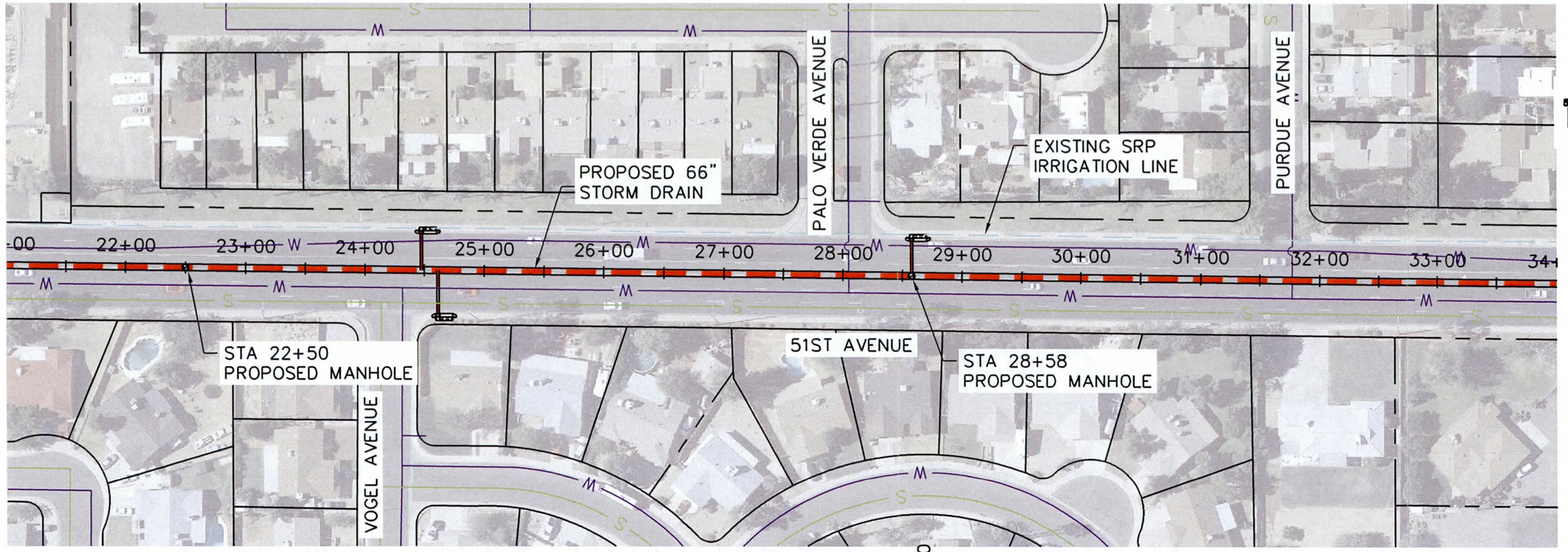

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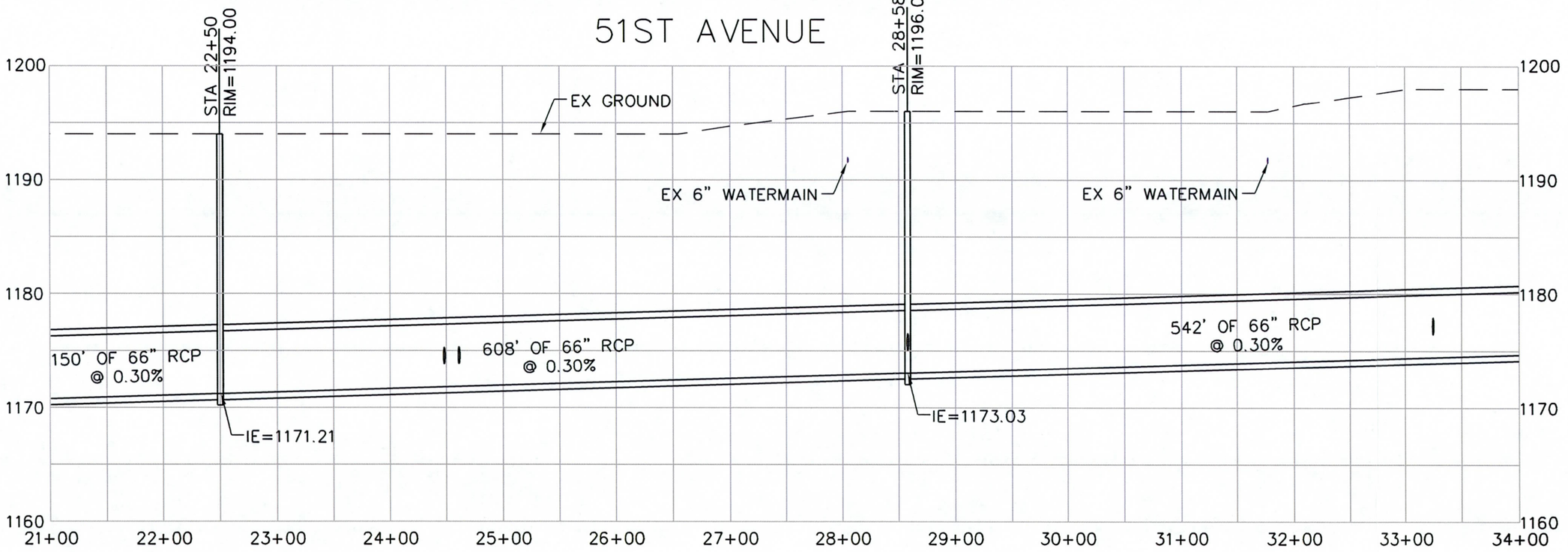

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
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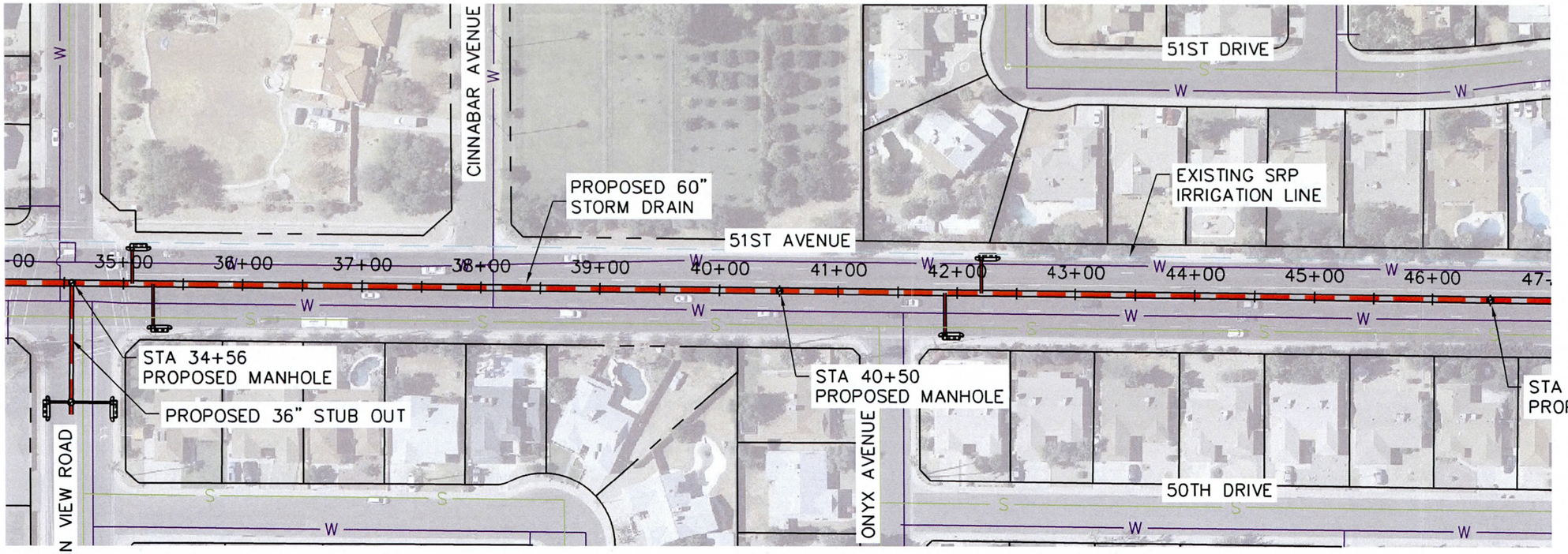

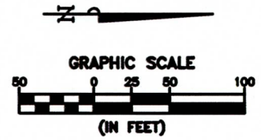

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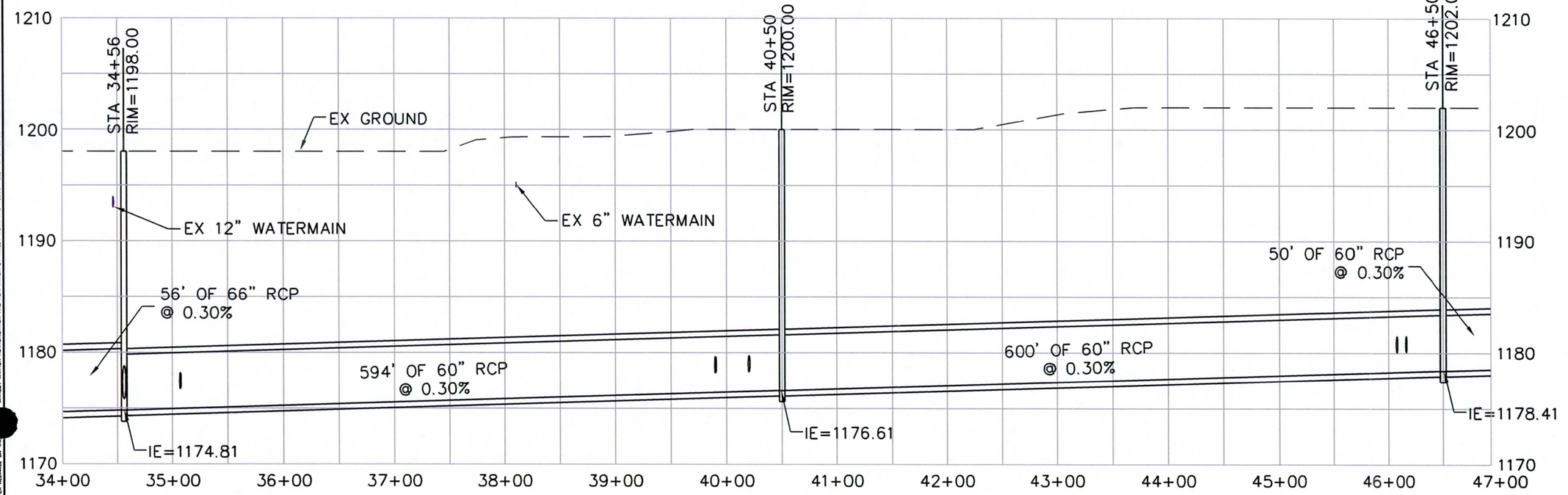

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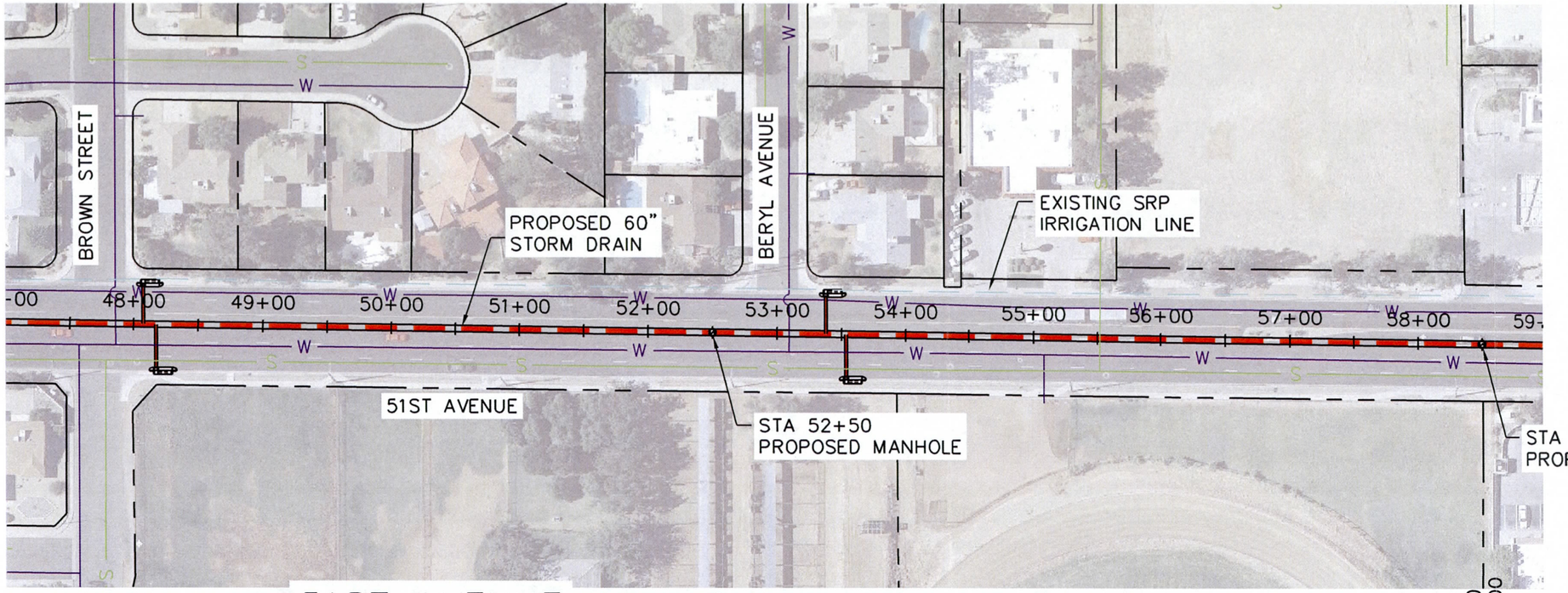
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO. 09191009
DRAWING NAME 0919100009PR17



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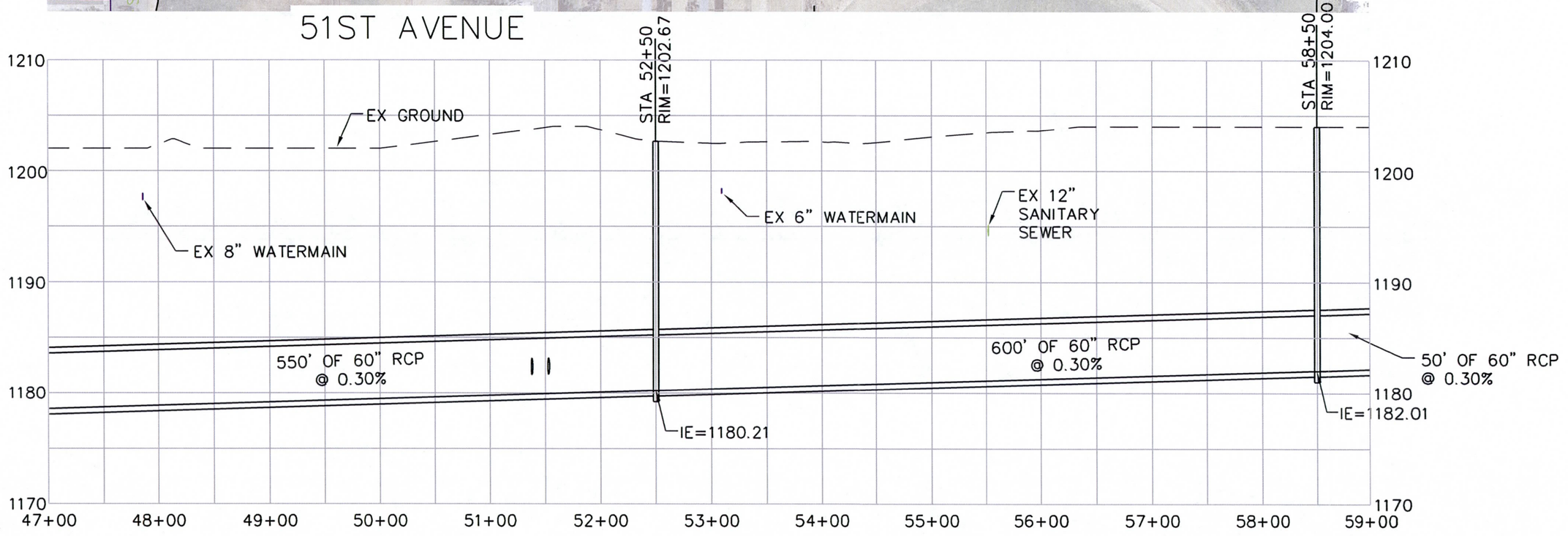

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
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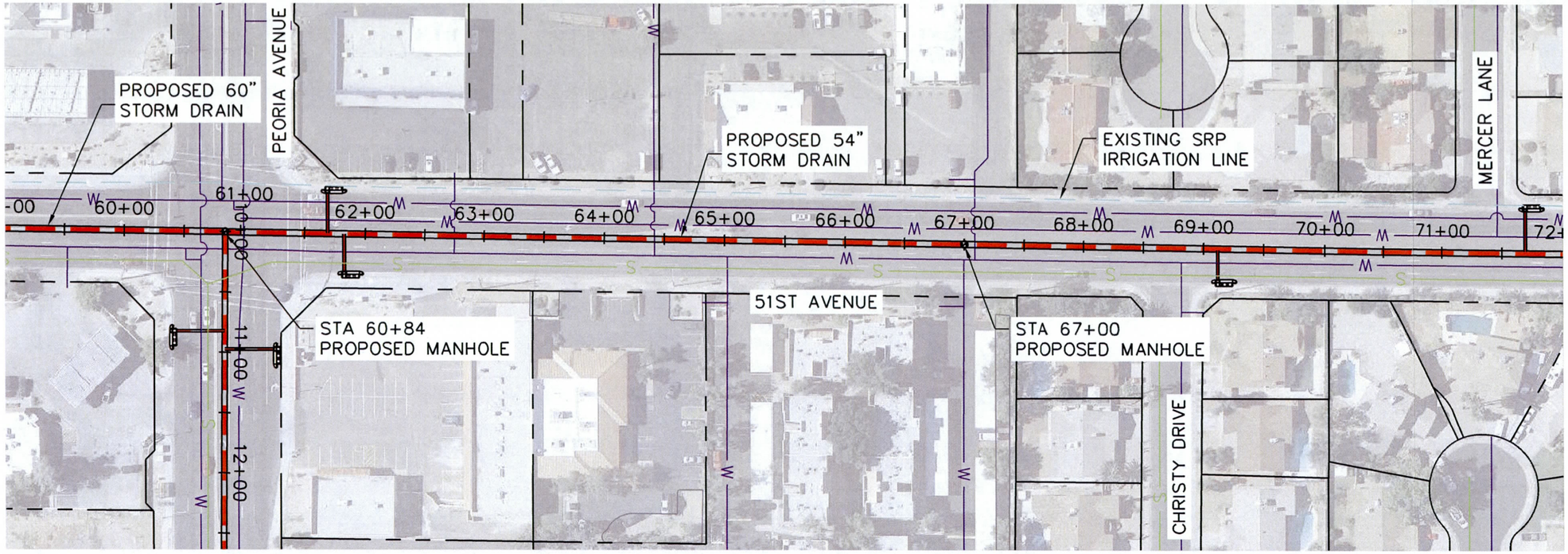

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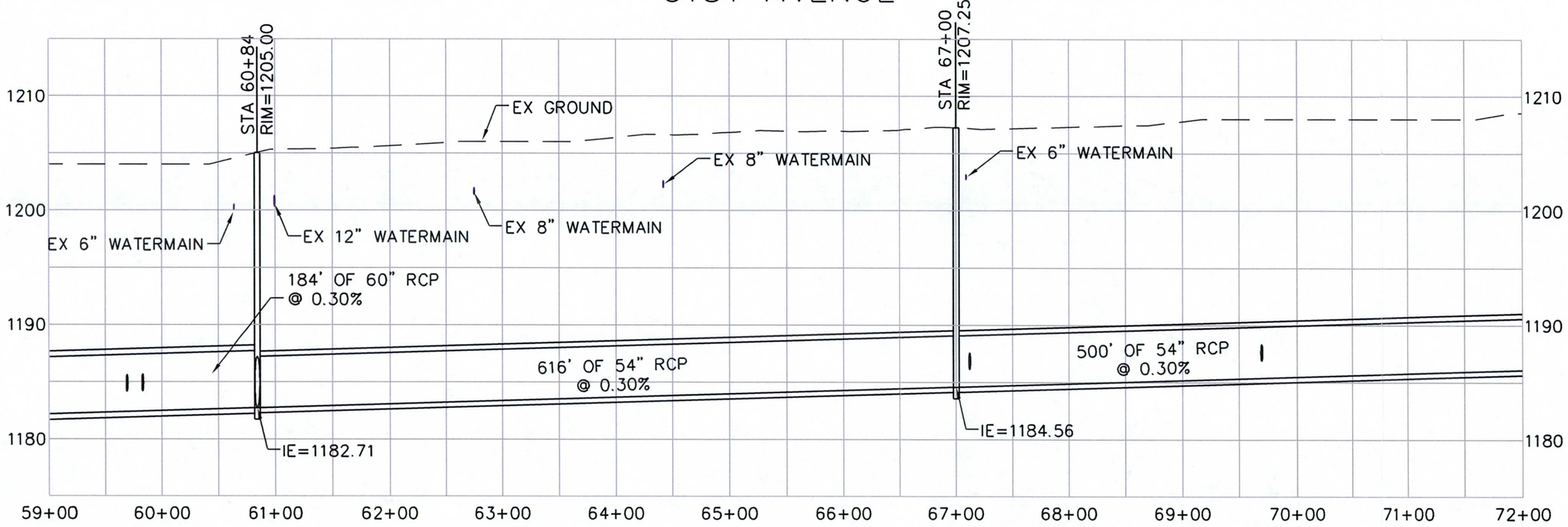

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
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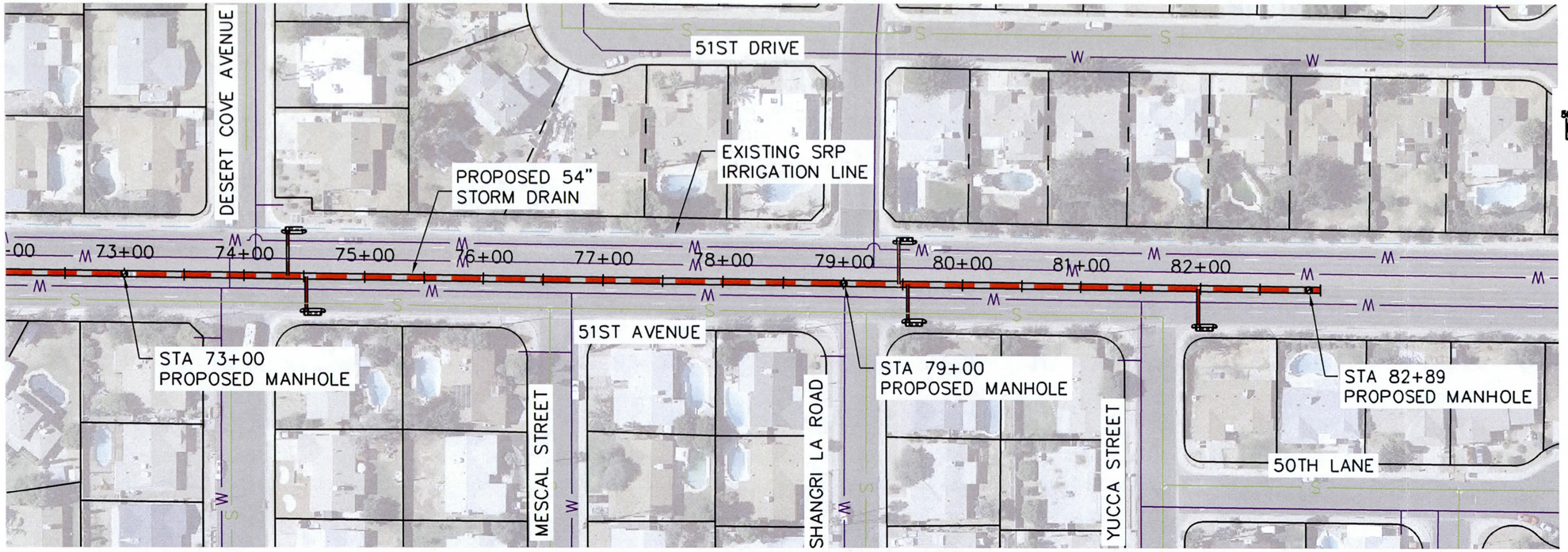

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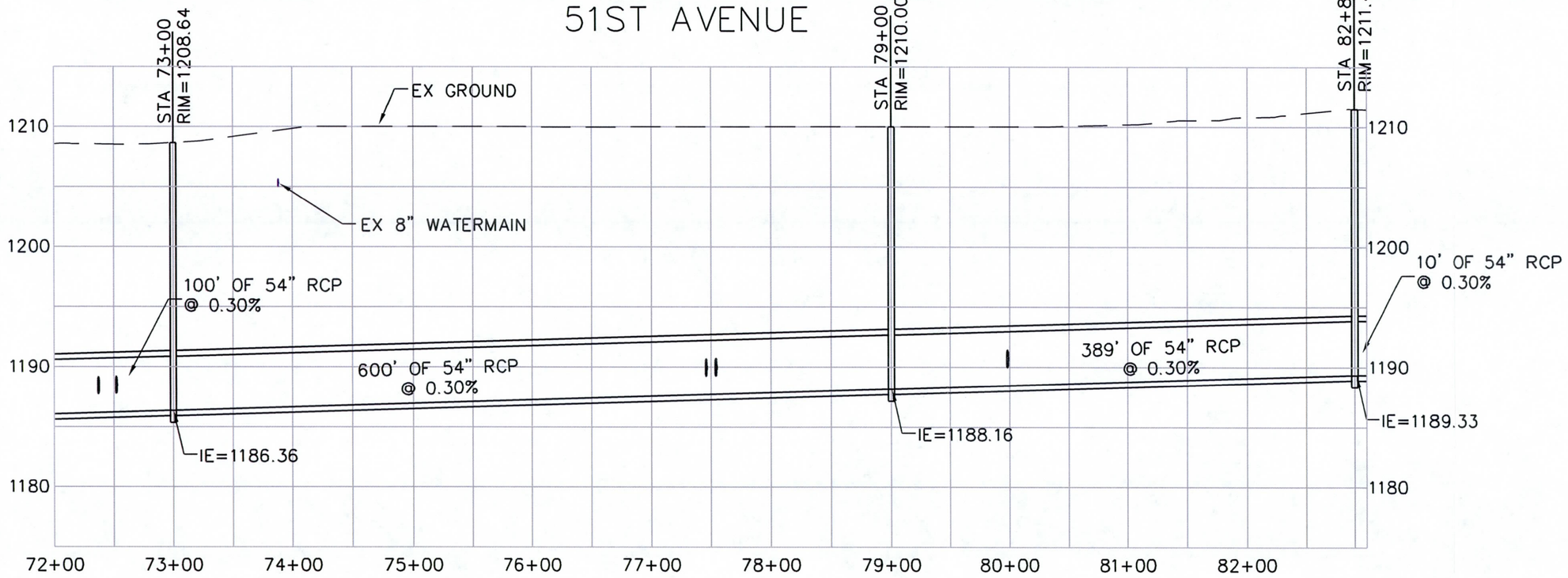

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR20

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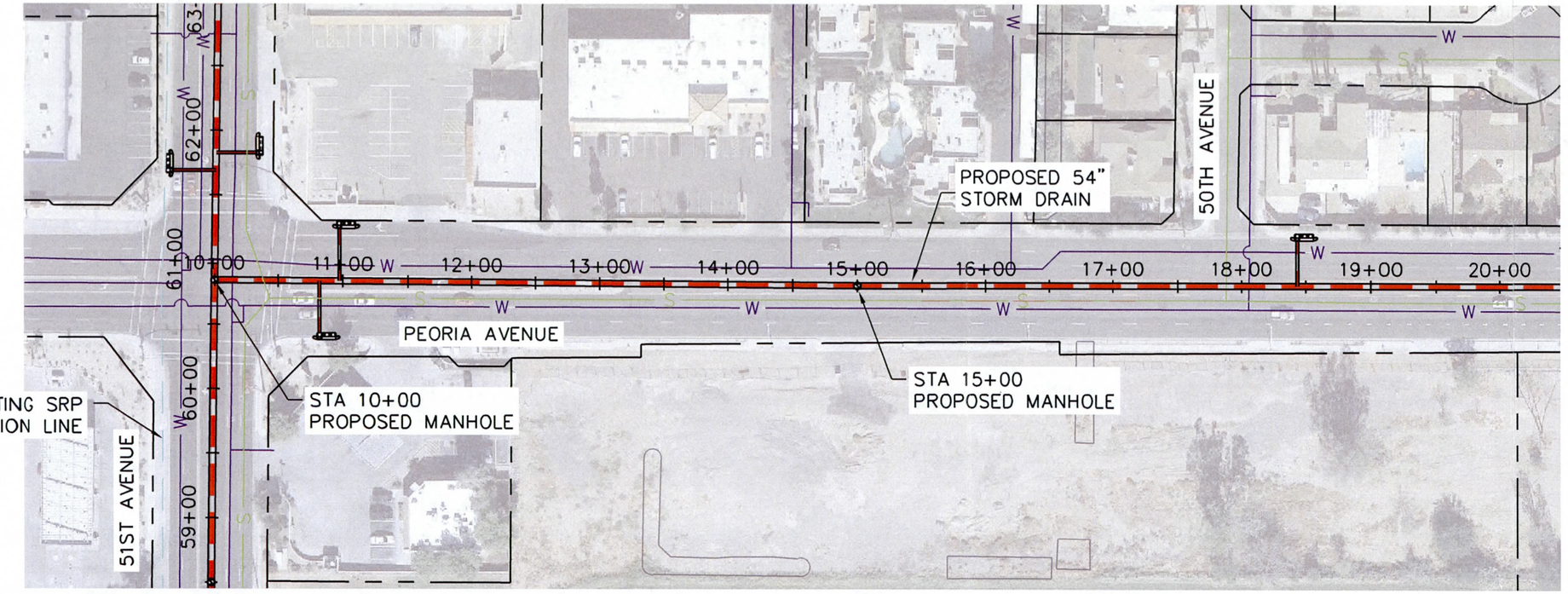

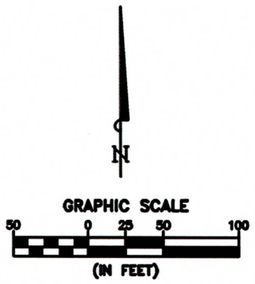

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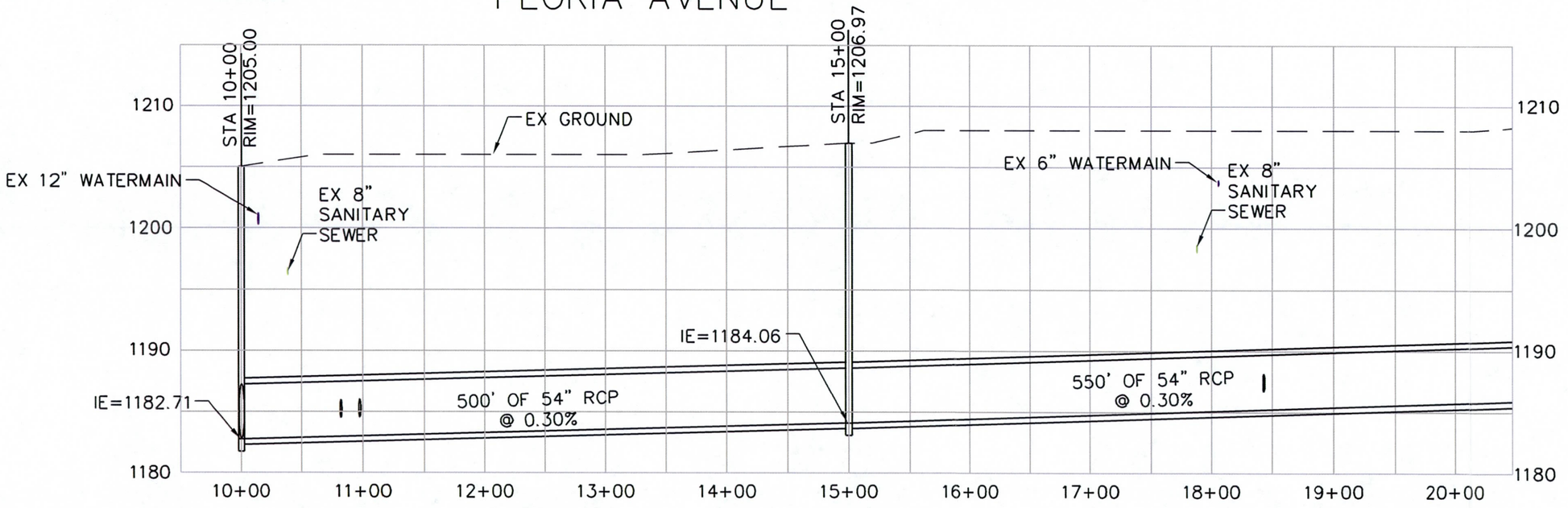

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

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0919100009PR21

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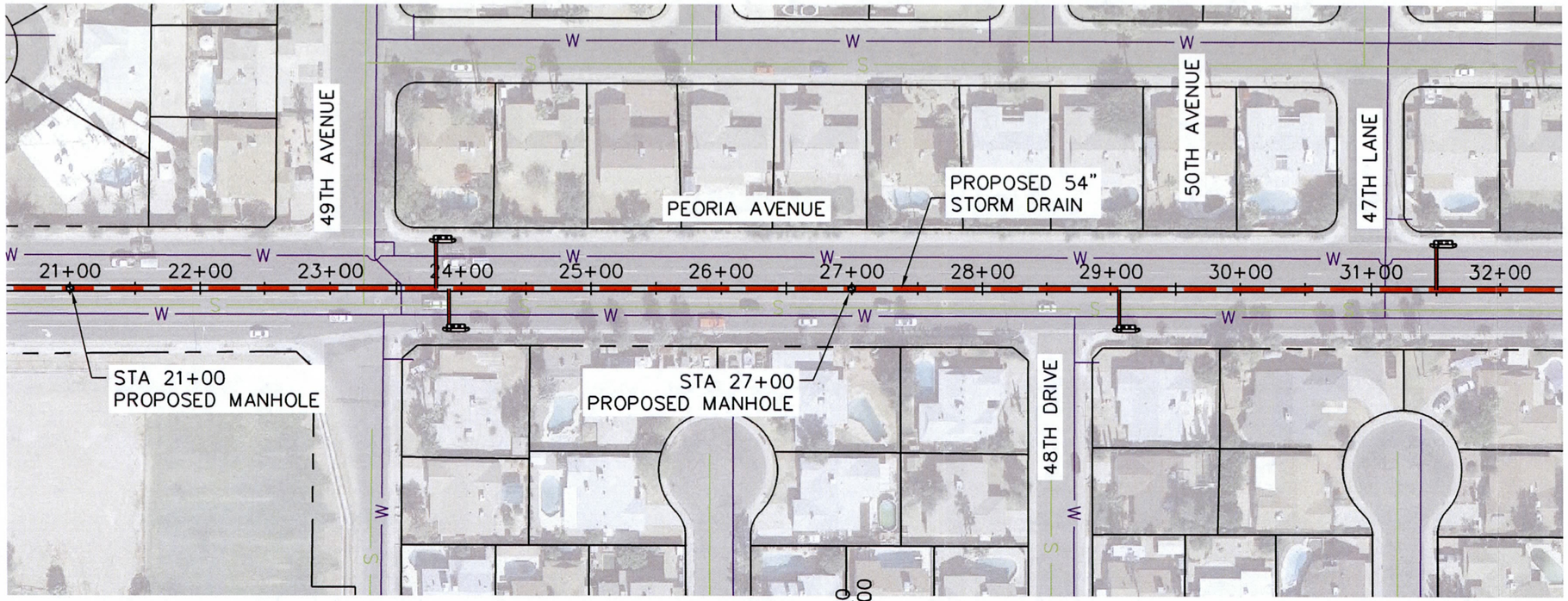

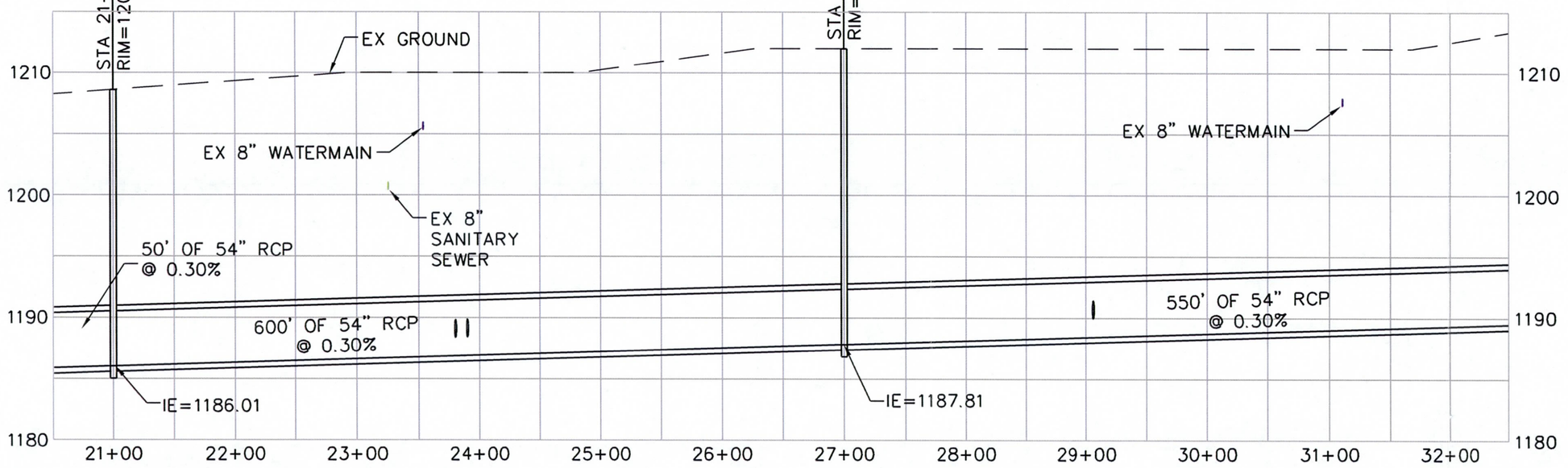

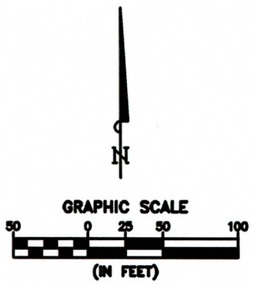

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR53

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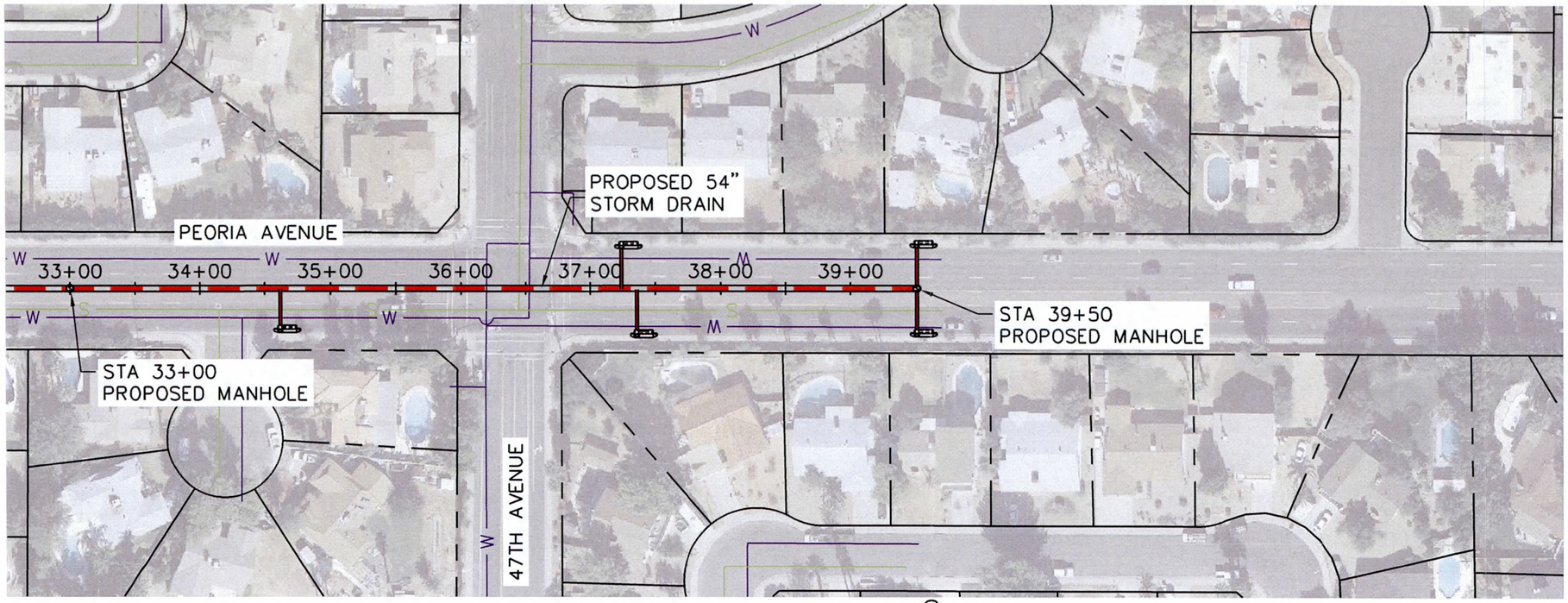

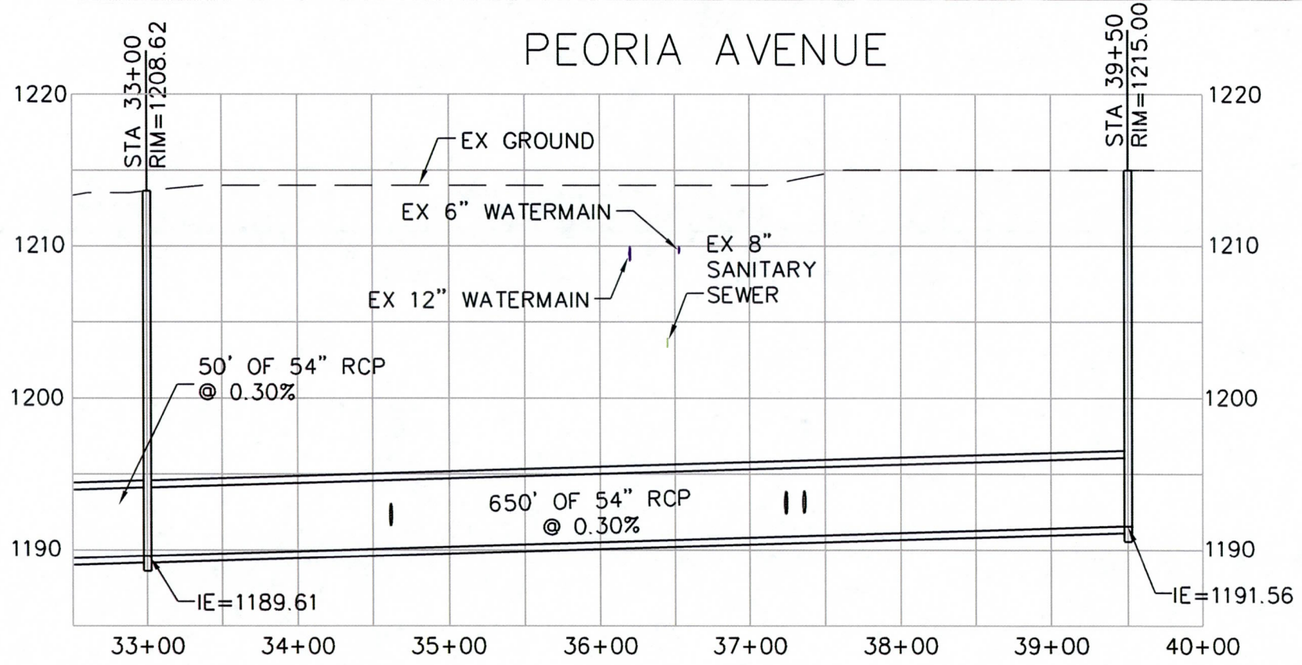

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTH OF OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR54

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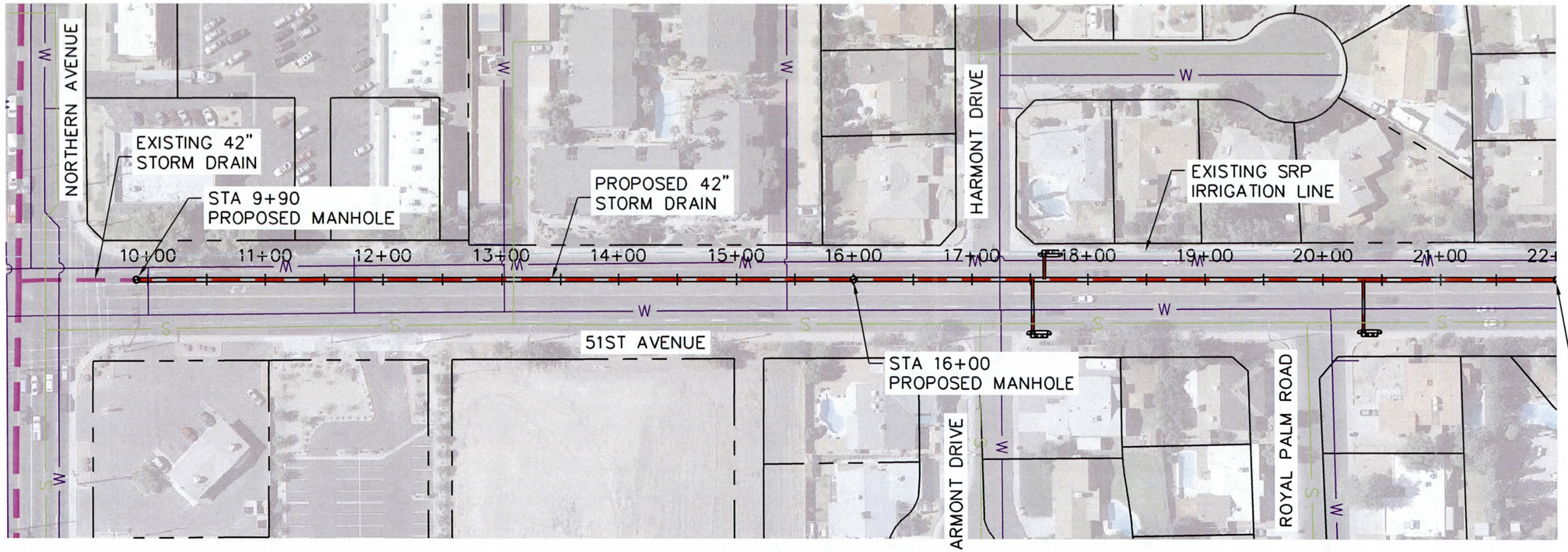

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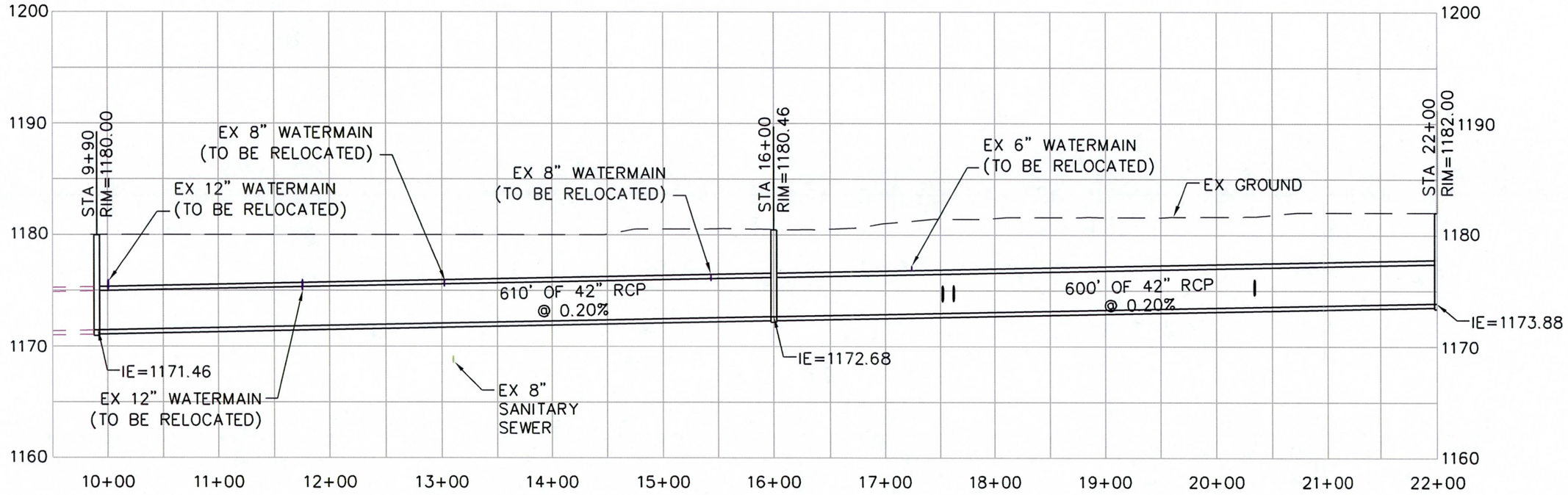

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CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
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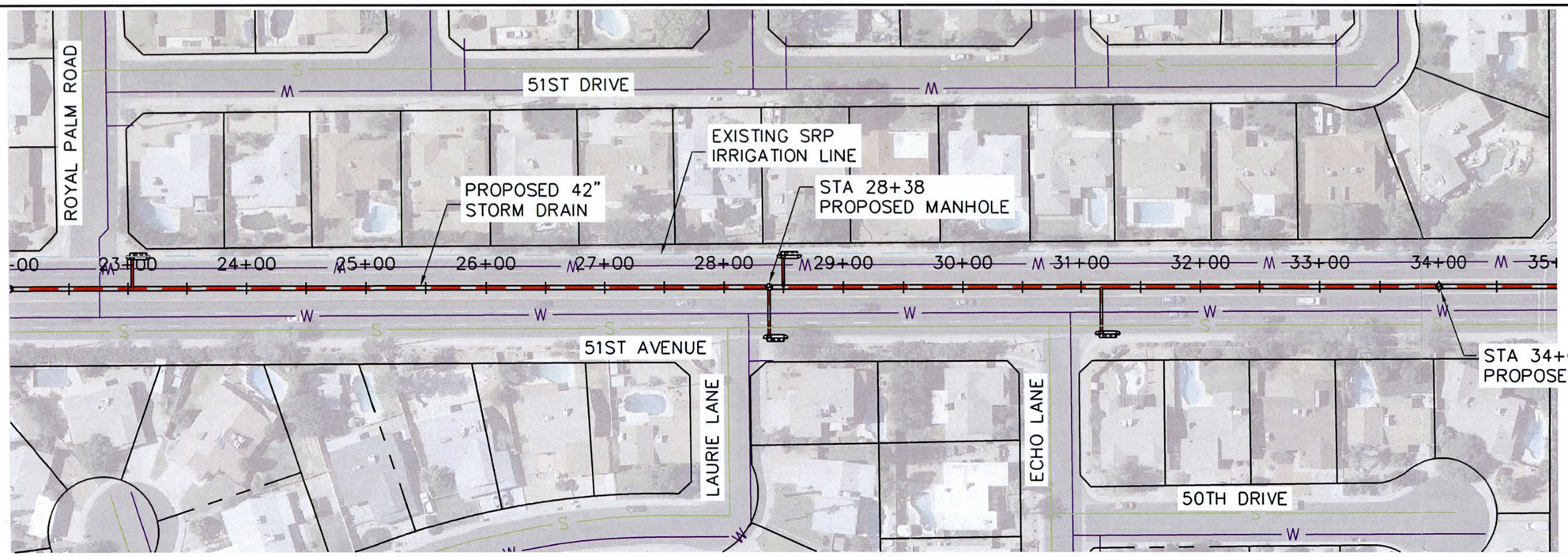

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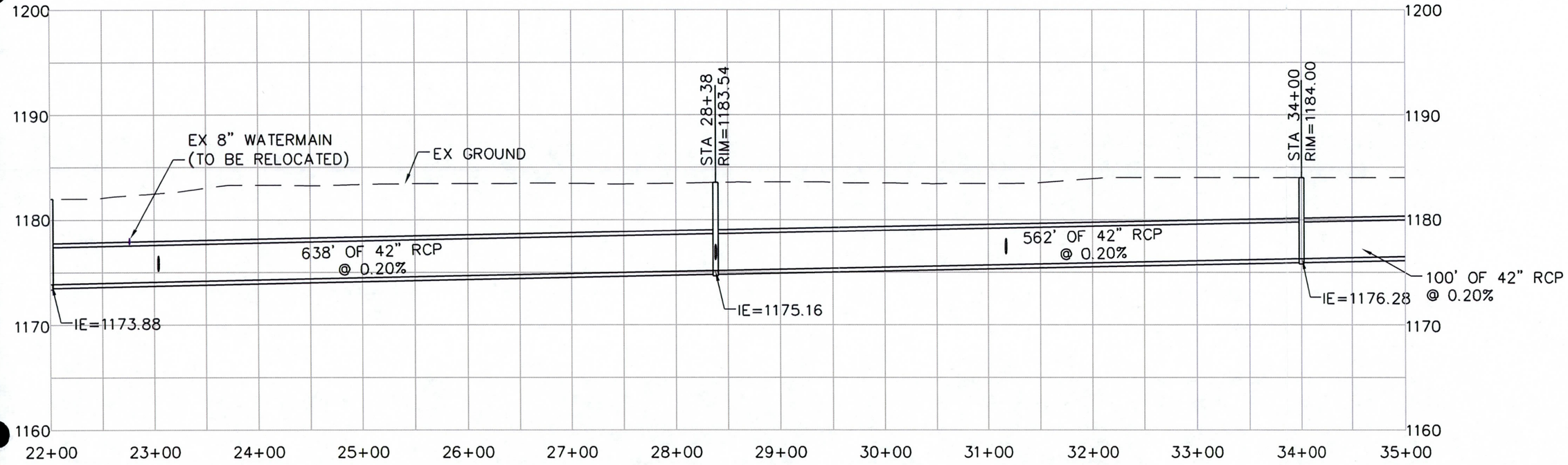

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
51ST AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
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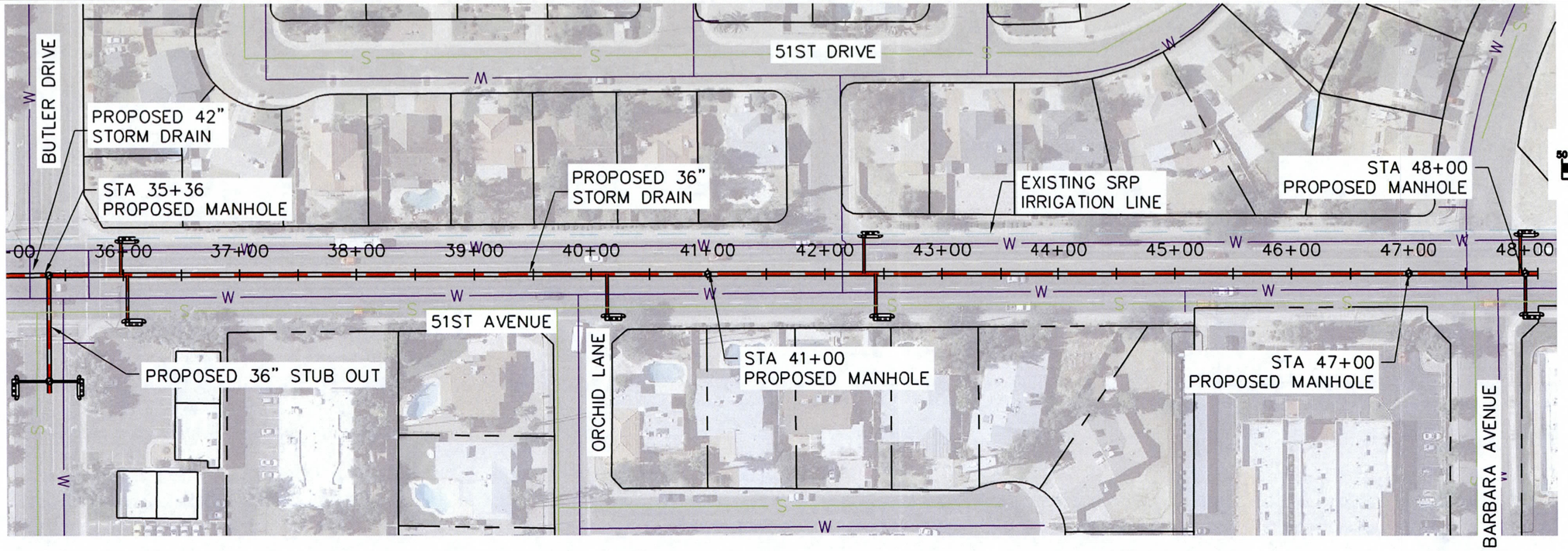

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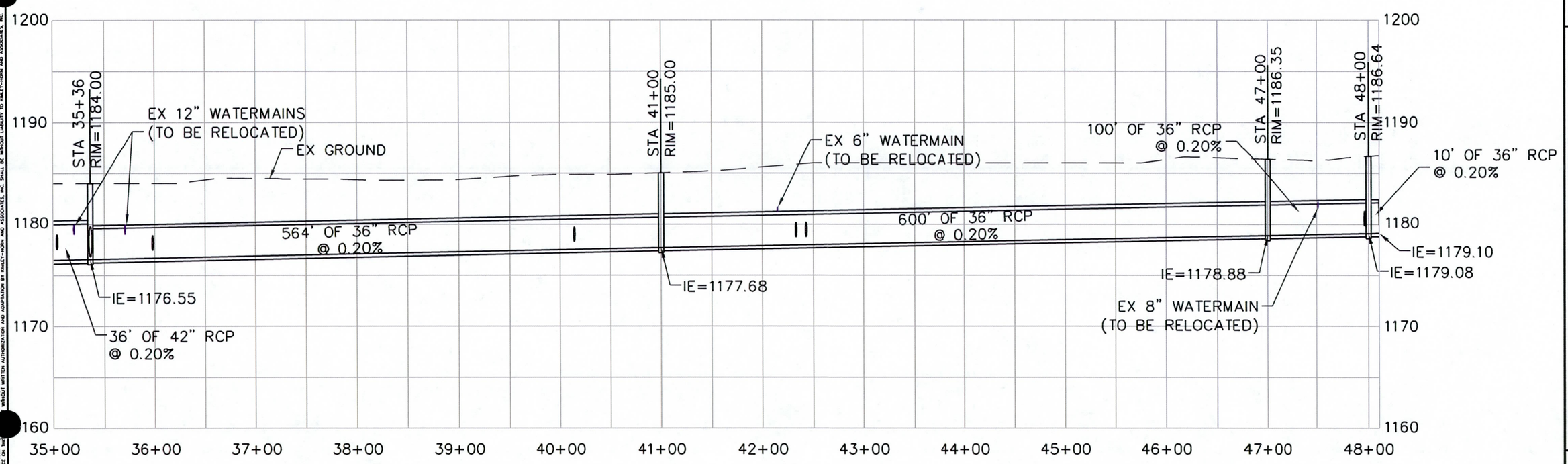

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CITY OF GLENDALE
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51ST AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

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0919100 09PR24

29 OF 54

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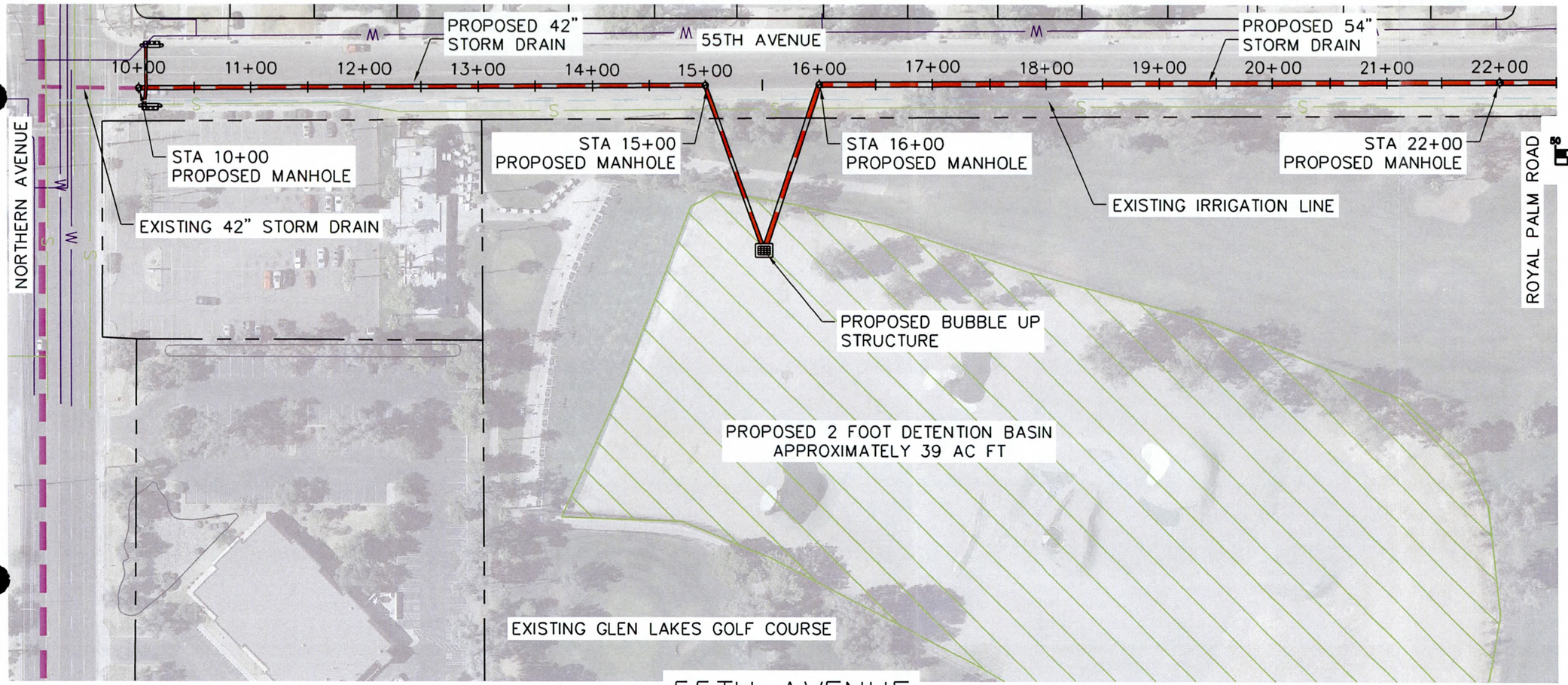

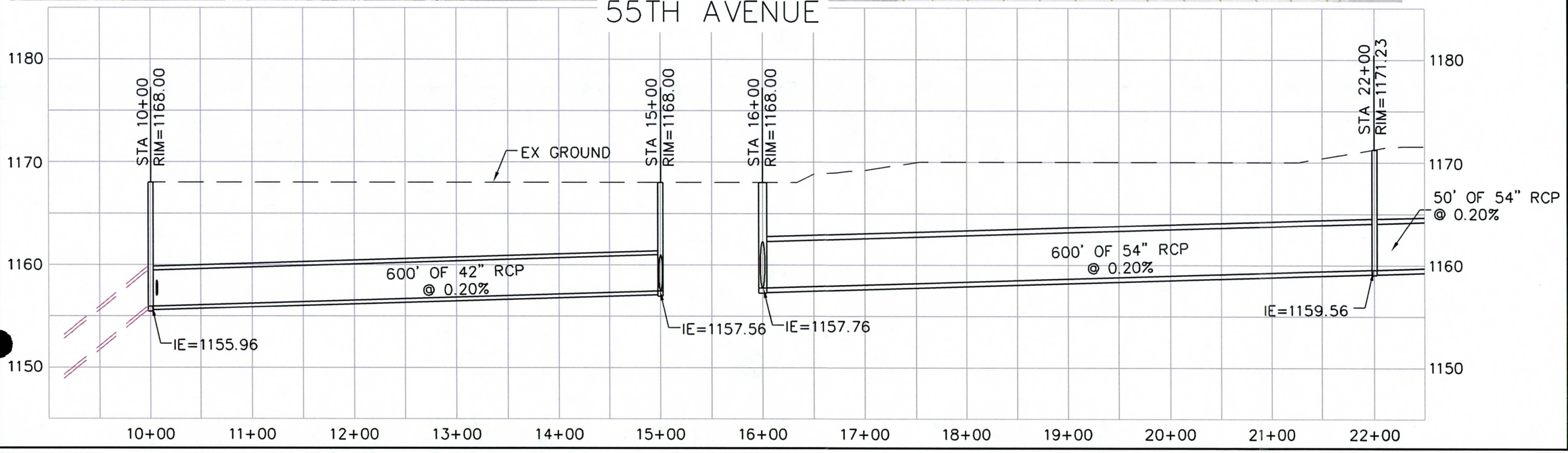

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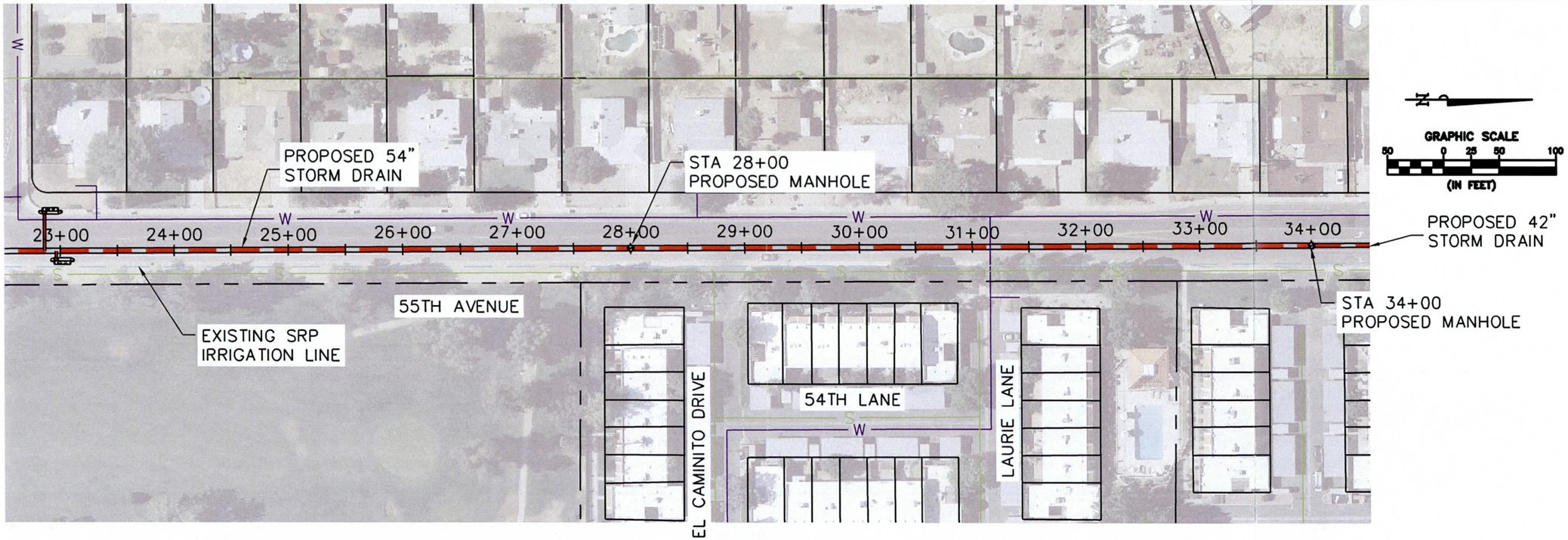
SCALE (V):NONE
DESIGNED BY: ZRS
DRAWN BY: ZRS
CHECKED BY: DEJ
DATE: 07/12/2011

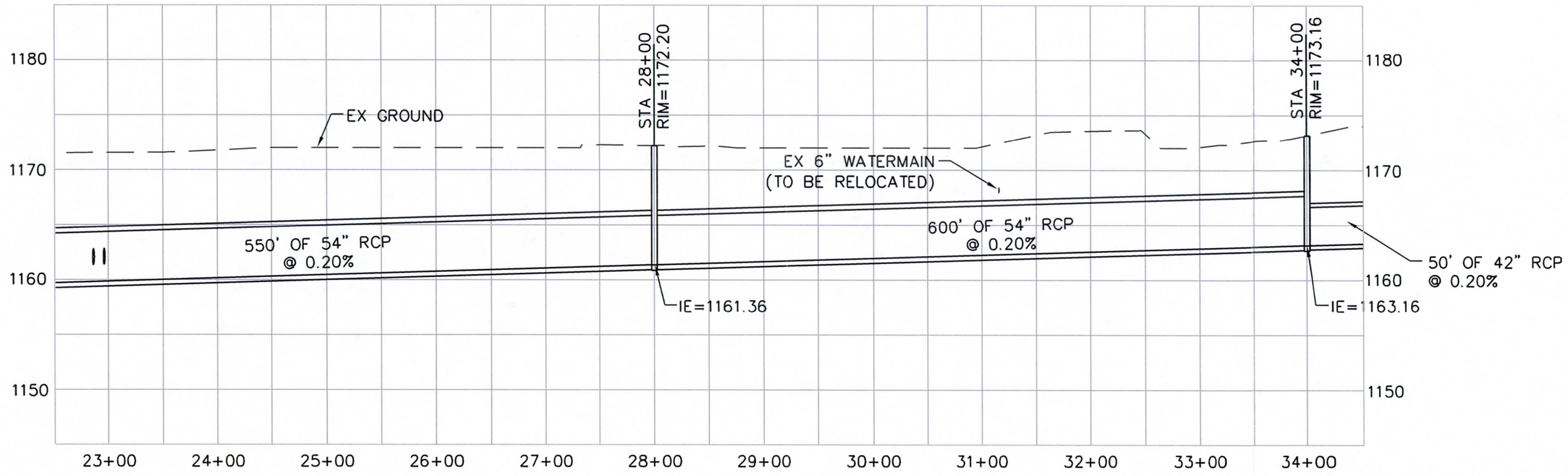
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
0919100009PR25



55TH AVENUE



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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
091910009

DRAWING NAME
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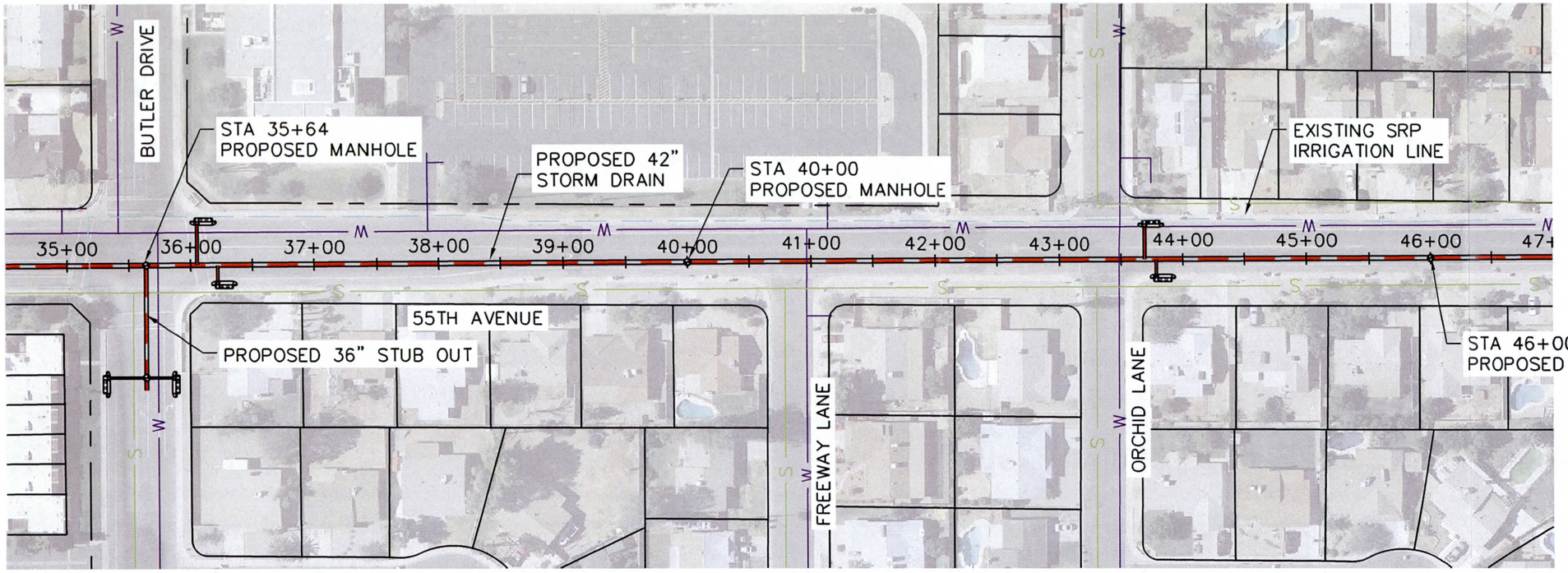

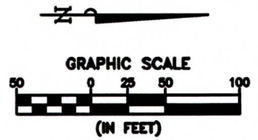

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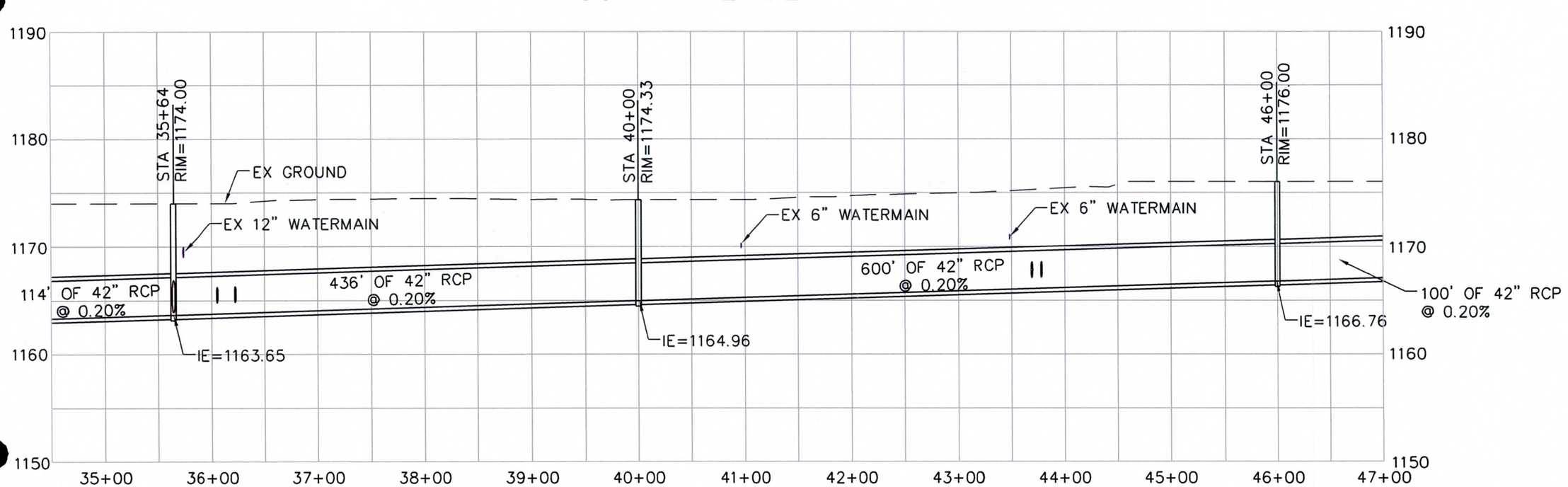

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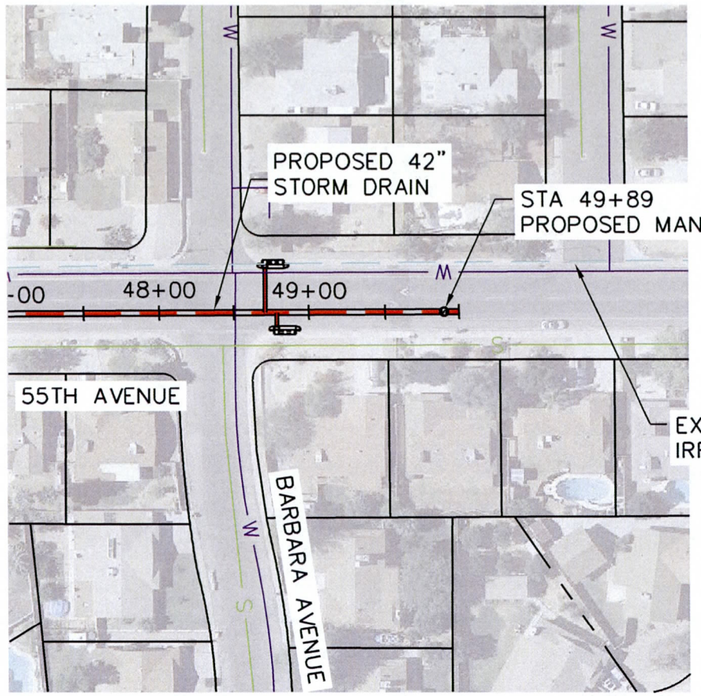
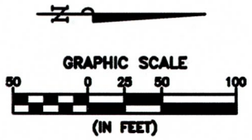
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR27





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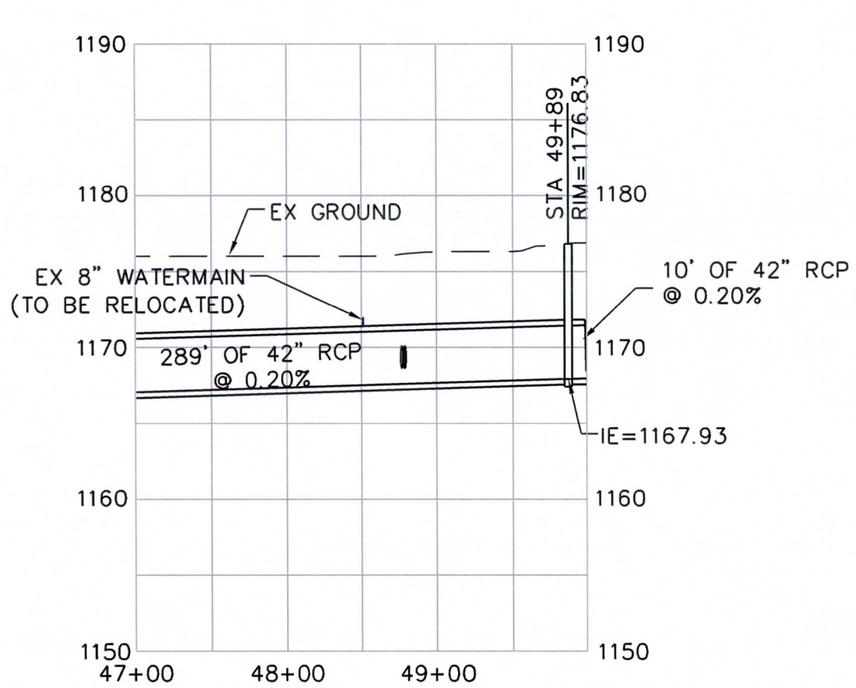

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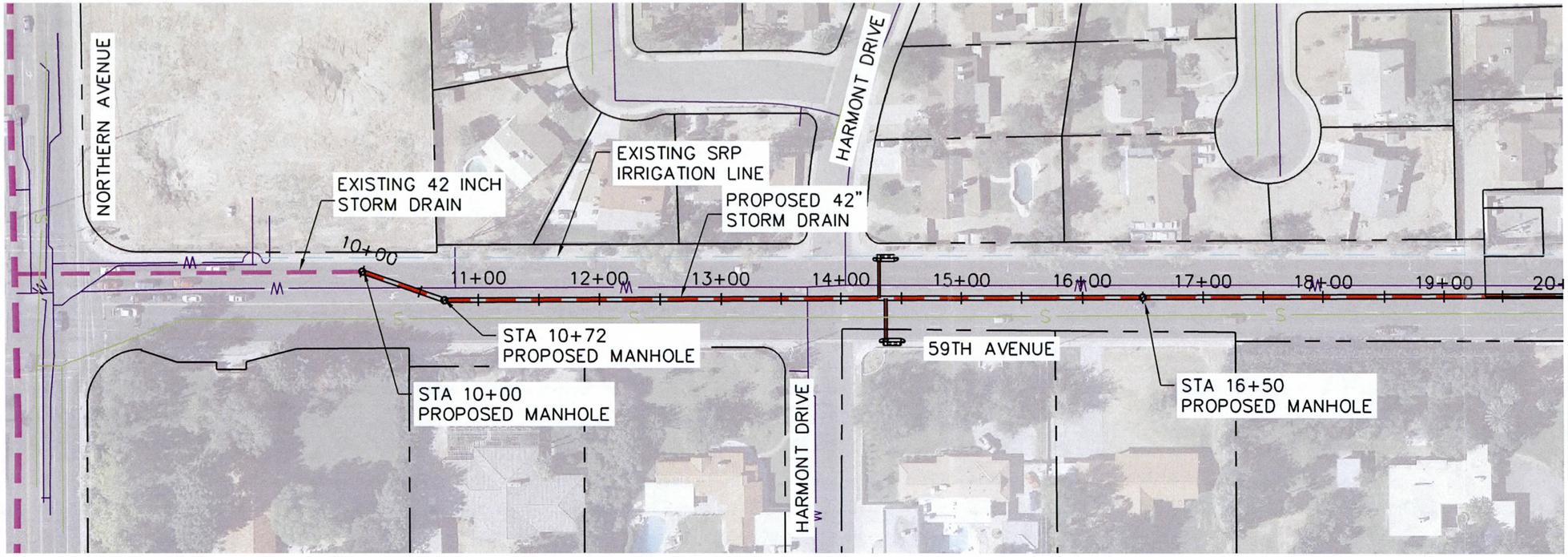
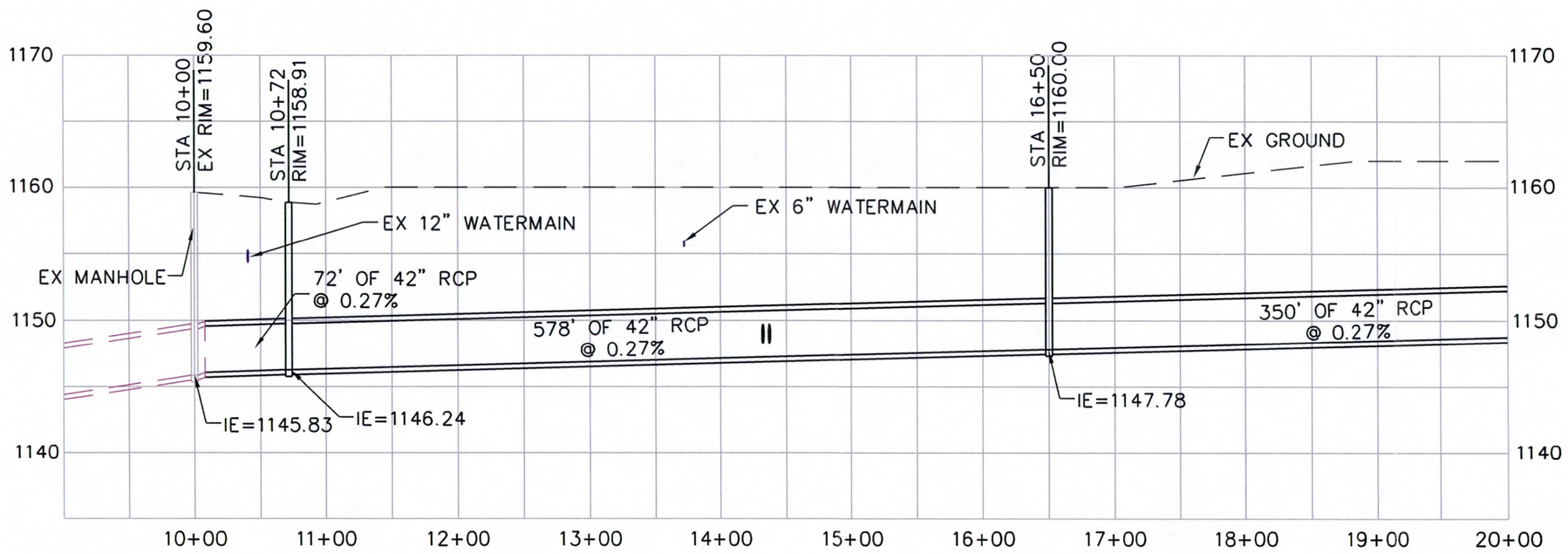
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
55TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR28



59TH AVENUE



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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR29

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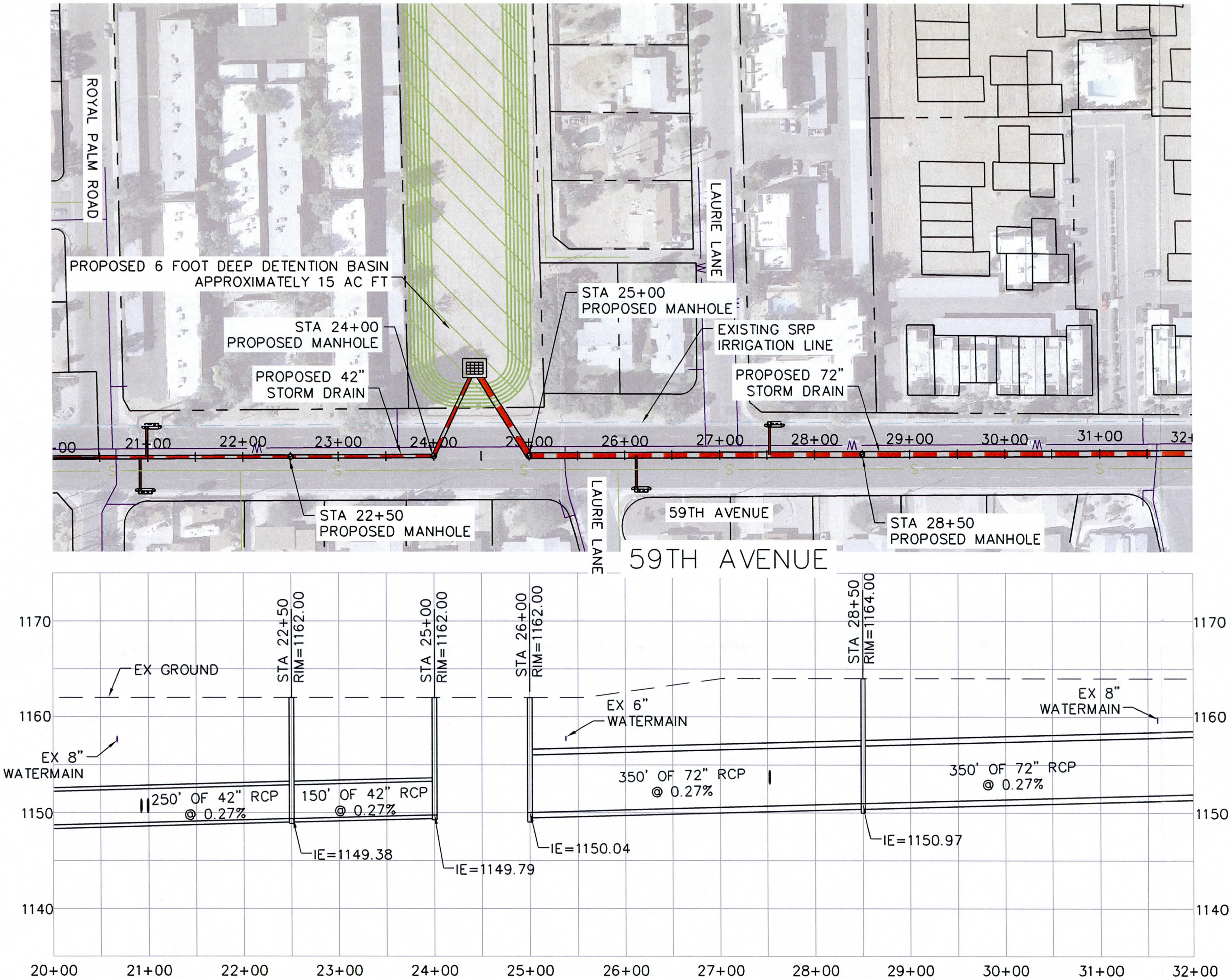

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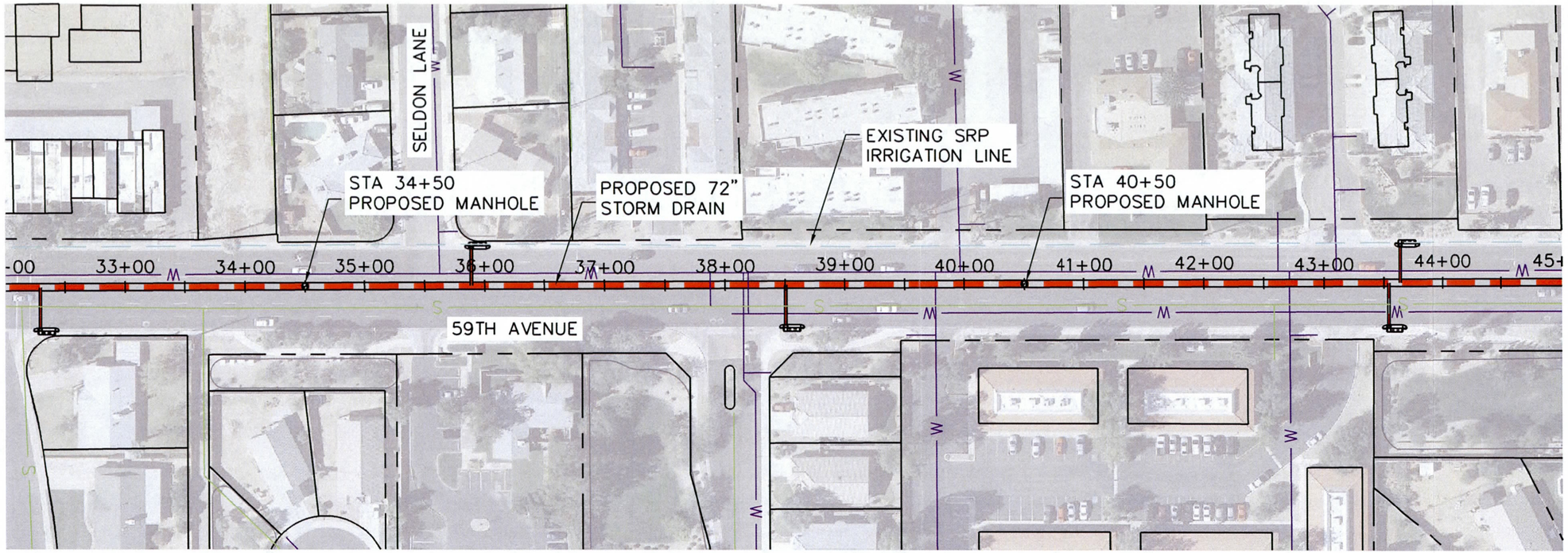
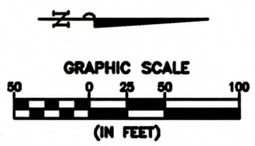
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR30





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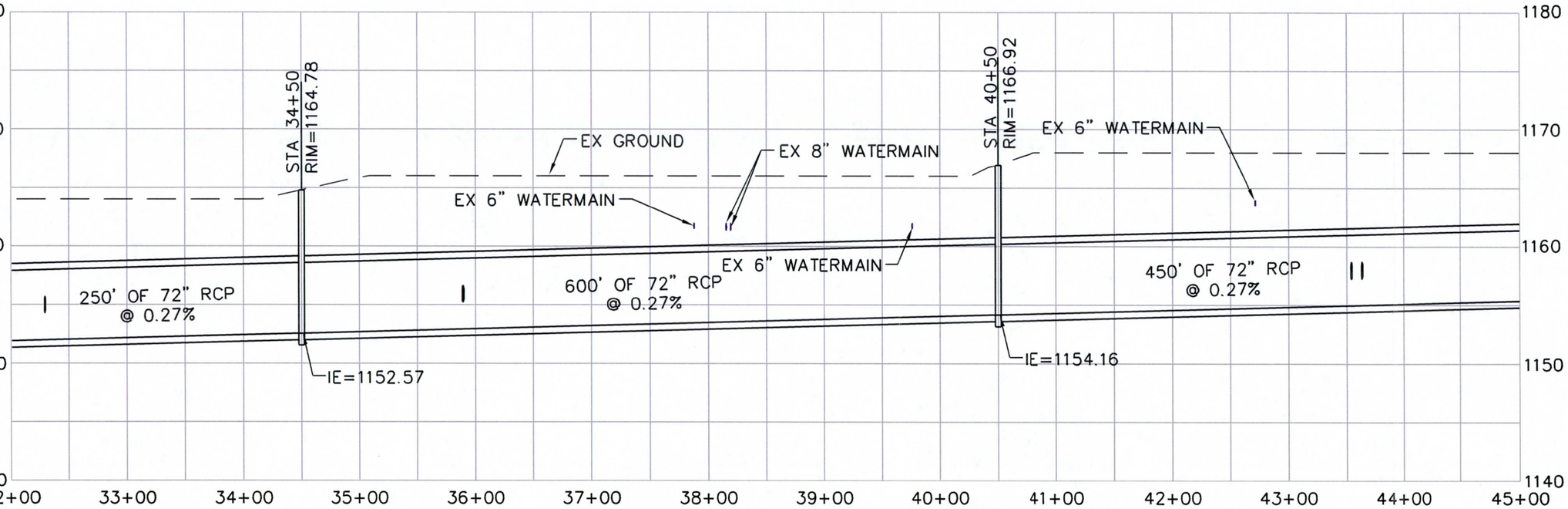

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
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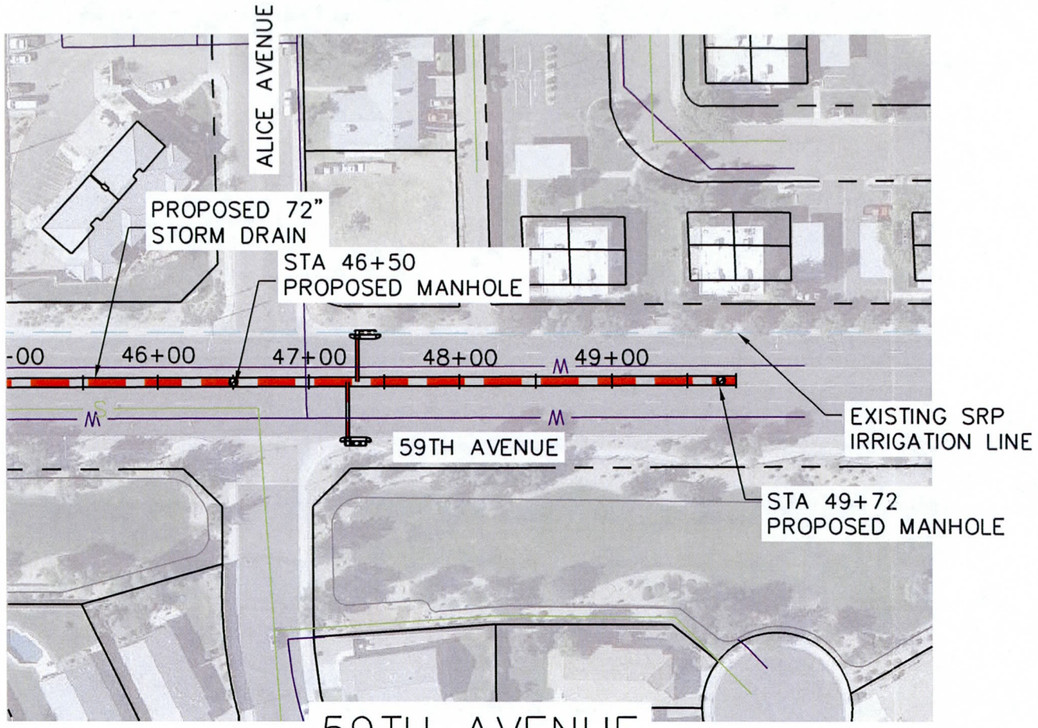

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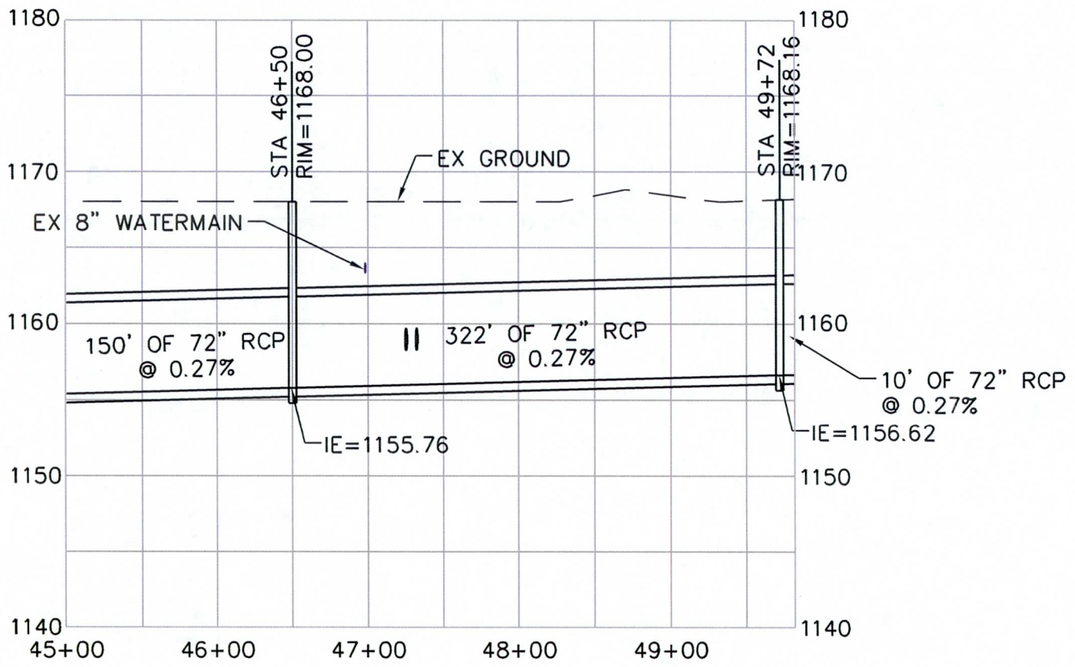

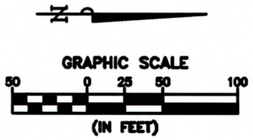

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – NORTHERN TO OLIVE

PROJECT NO.
09191009

DRAWING NAME
091910009PR32

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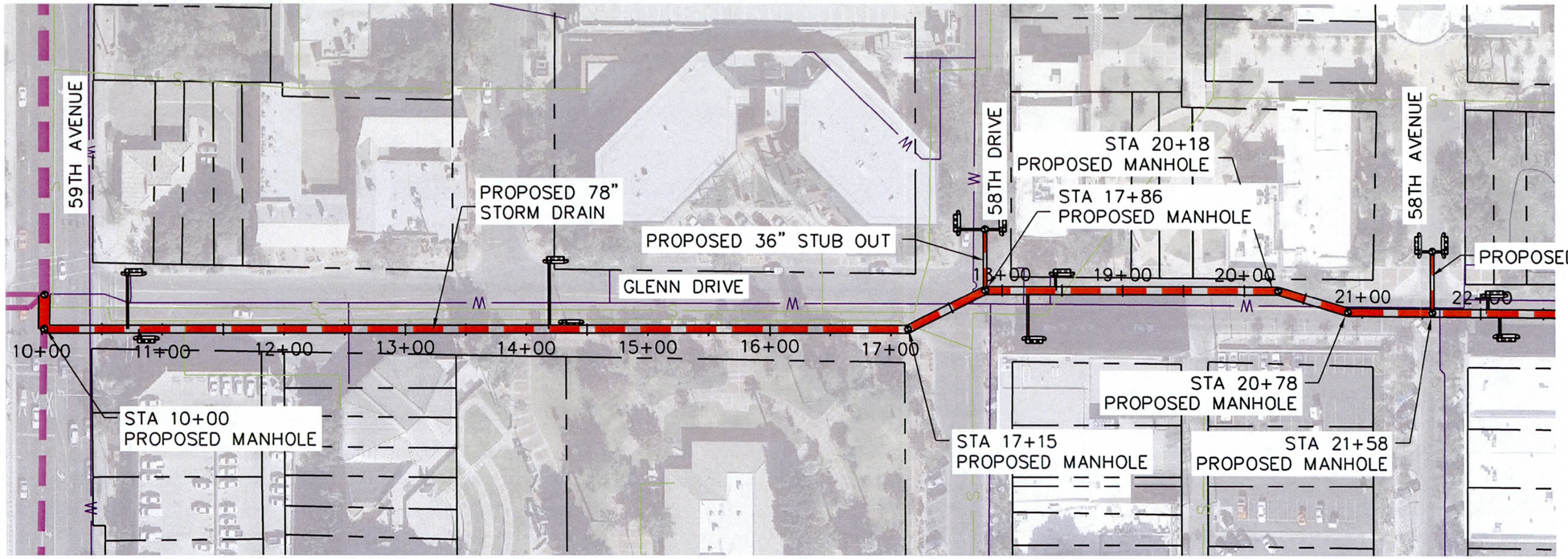

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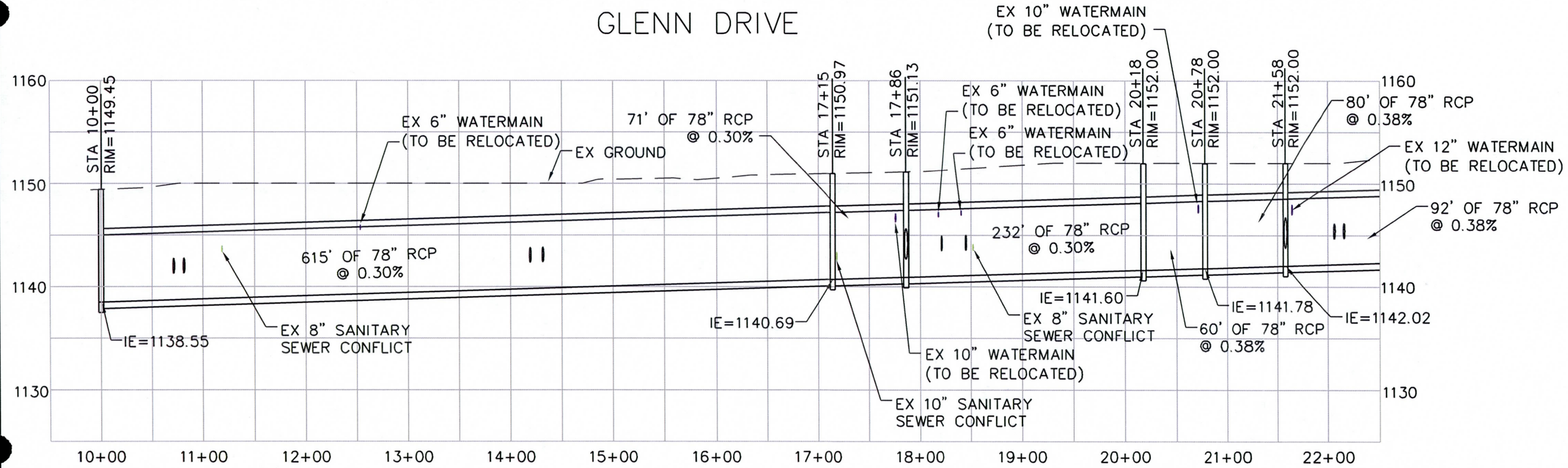

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
DOWNTOWN GLENDALE

PROJECT NO.
09191009

DRAWING NAME
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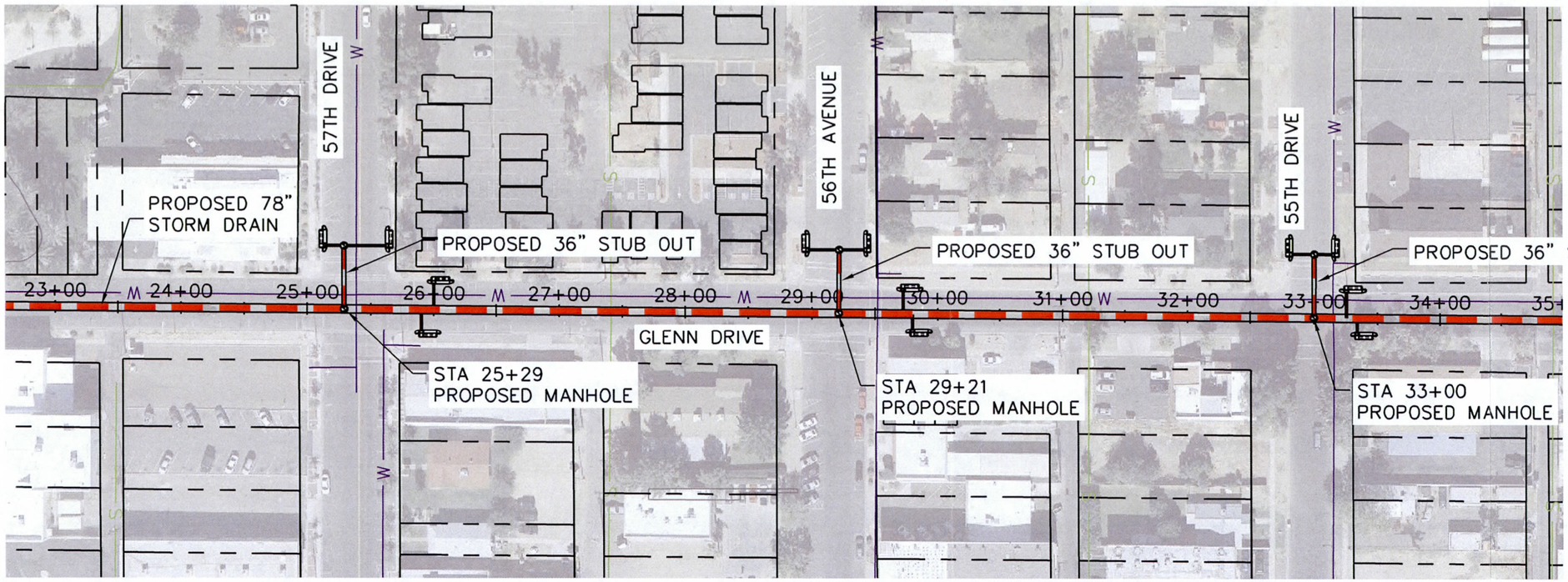

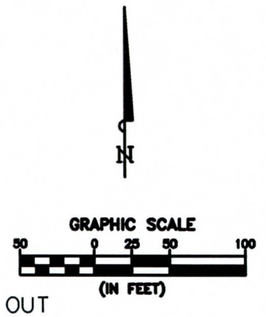

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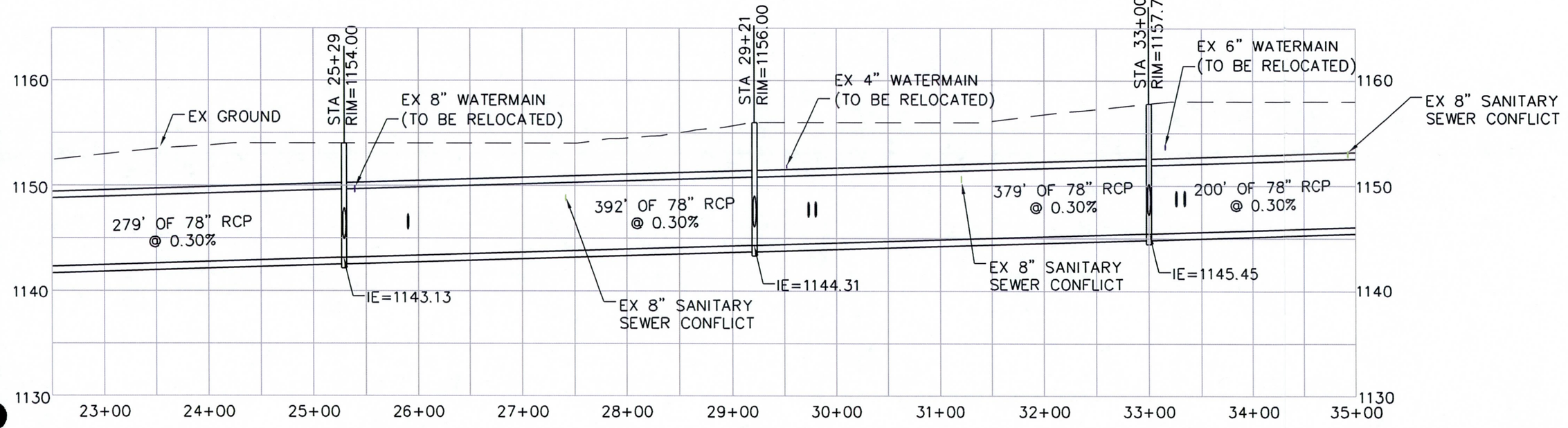

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
DOWNTOWN GLENDALE

PROJECT NO.
09191009

DRAWING NAME
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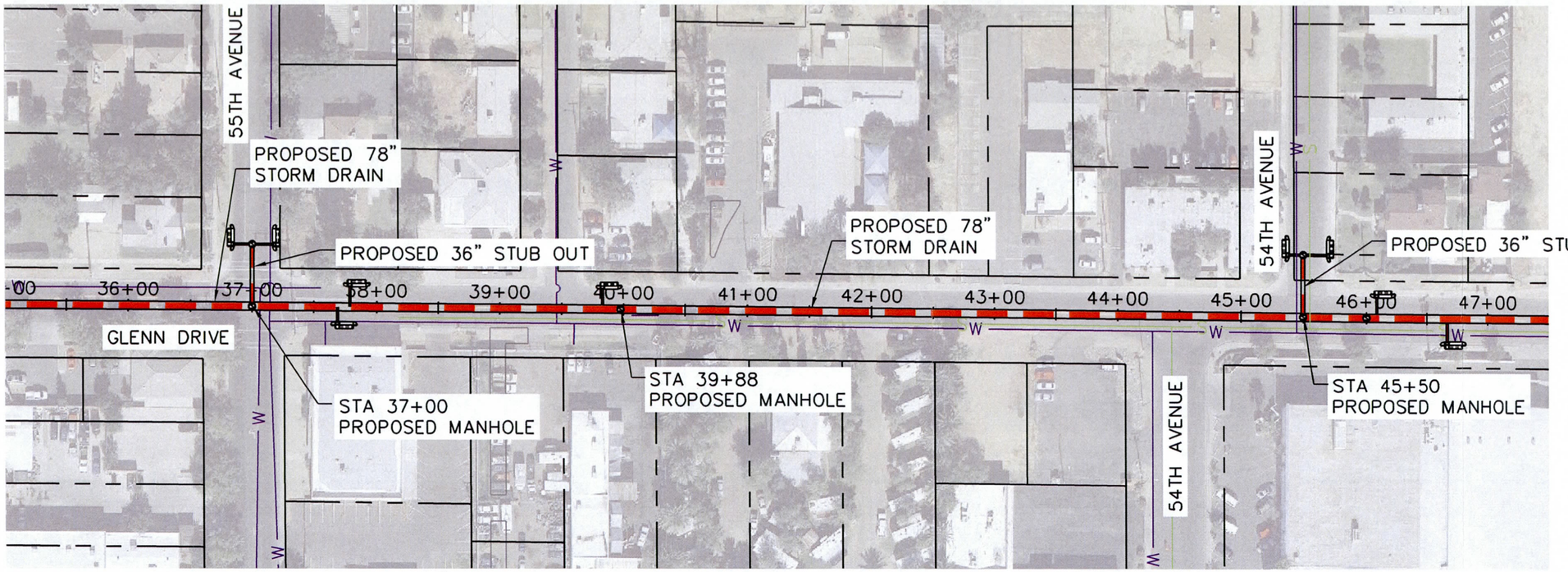

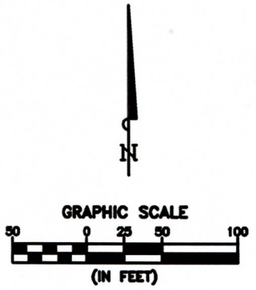

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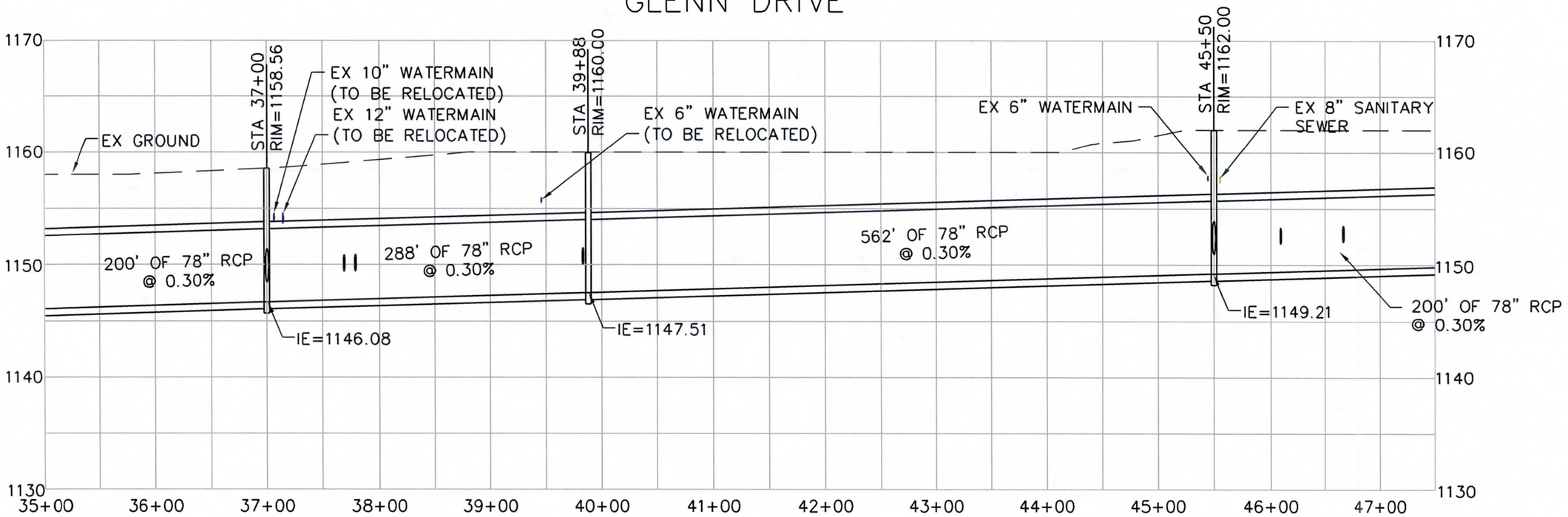

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
DOWNTOWN GLENDALE

PROJECT NO.
09191009

DRAWING NAME
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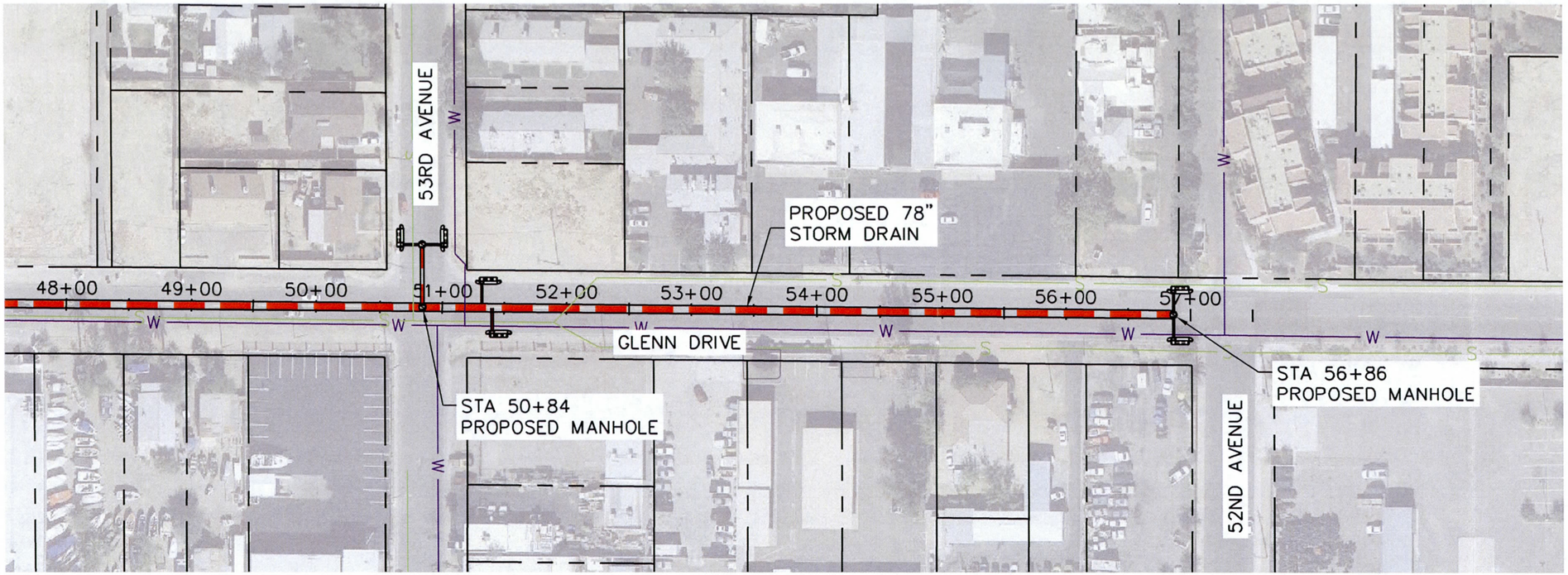

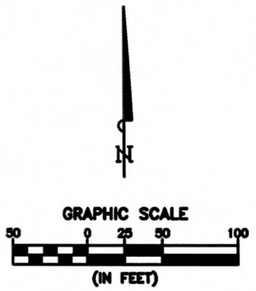

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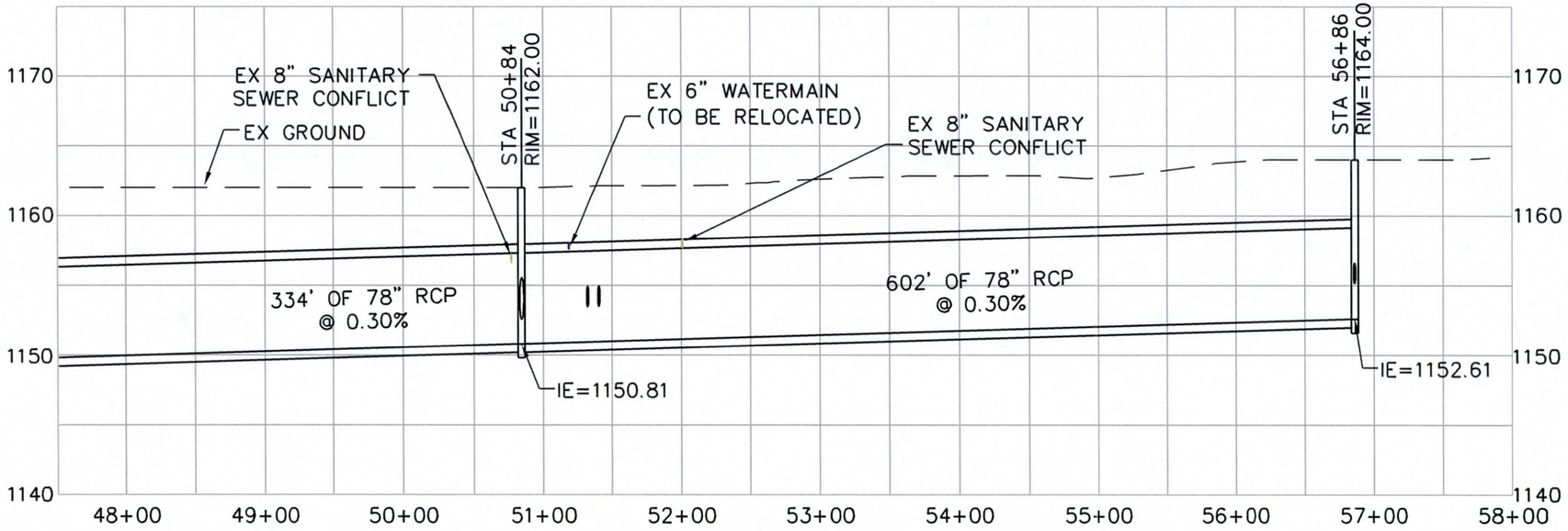

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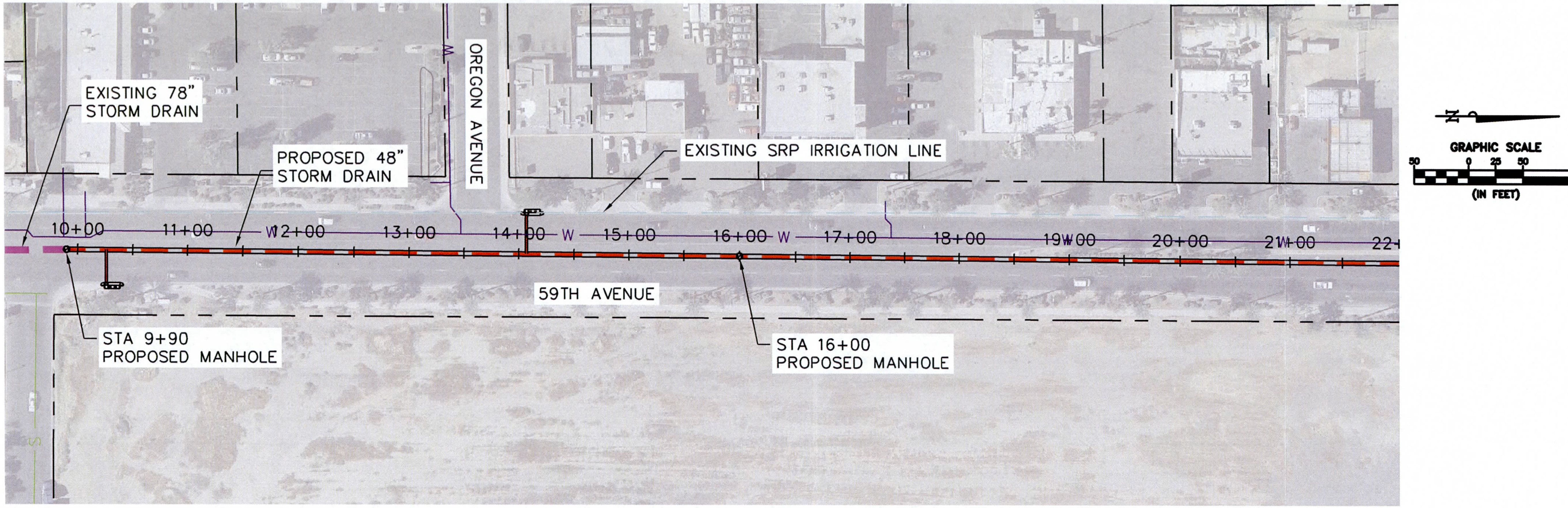
SCALE (V):NONE
DESIGNED BY: ZRS
DRAWN BY: ZRS
CHECKED BY: DEJ
DATE: 07/12/2011

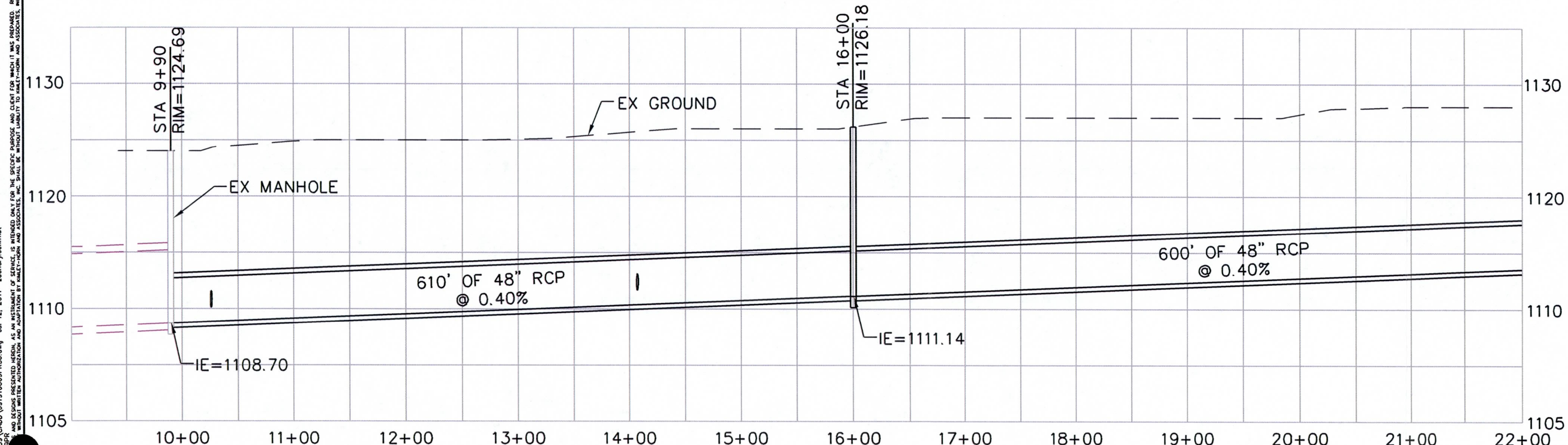
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
DOWNTOWN GLENDALE

PROJECT NO.
09191009

DRAWING NAME
091910009PR52



59TH AVENUE



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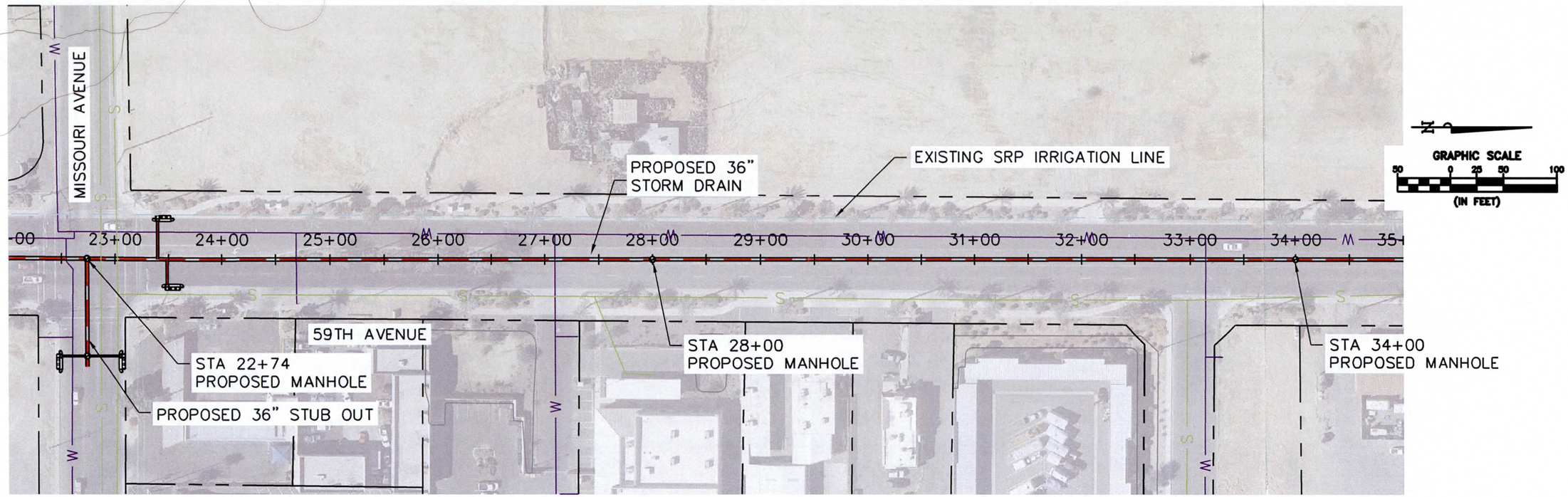
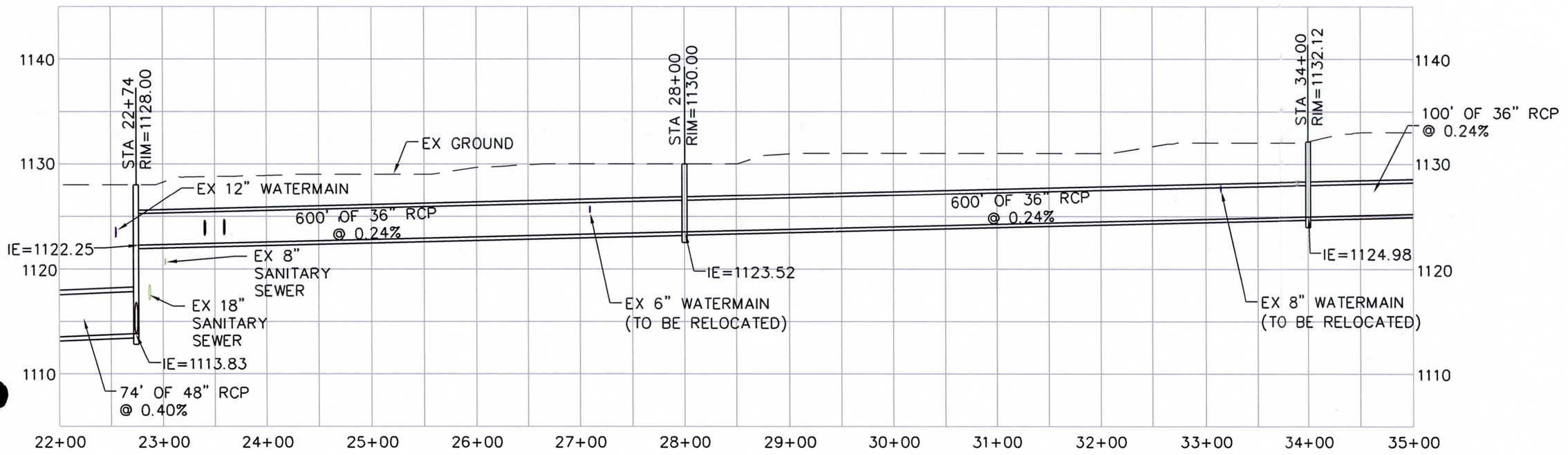
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – CAMELBACK TO BETHANY HOME

PROJECT NO. 09191009

DRAWING NAME 091910009PR36



59TH AVENUE



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XREFS: a310009_Aerial_091910009PR37.dwg
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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – CAMELBACK TO BETHANY HOME

PROJECT NO.
09191009

DRAWING NAME
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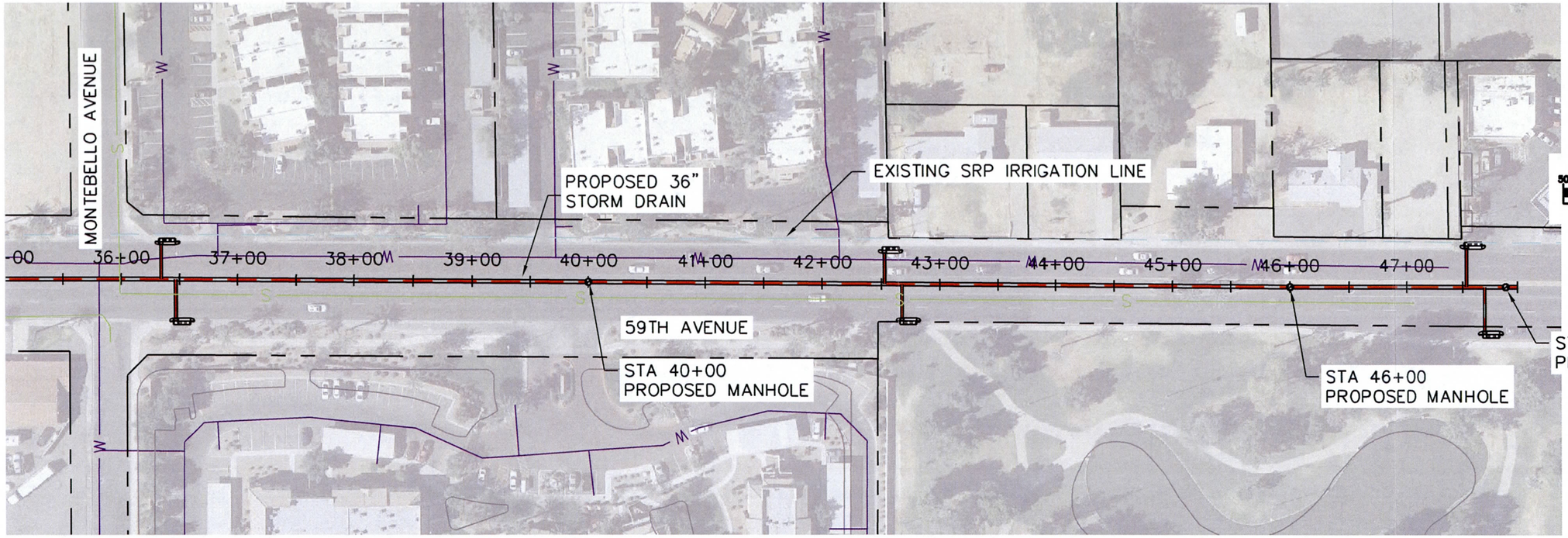

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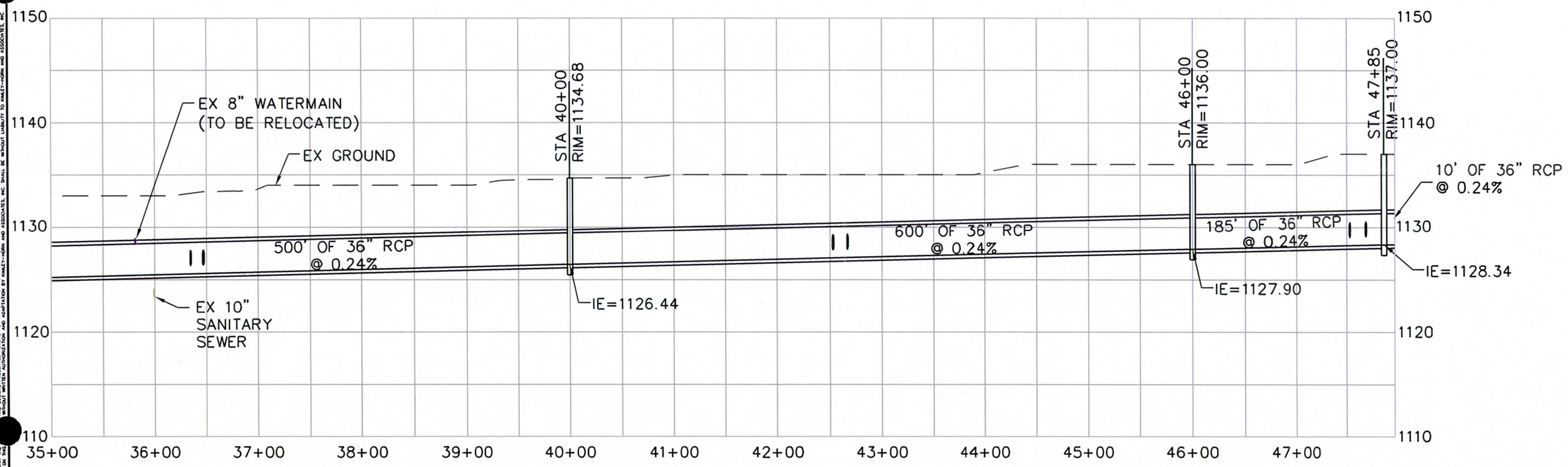

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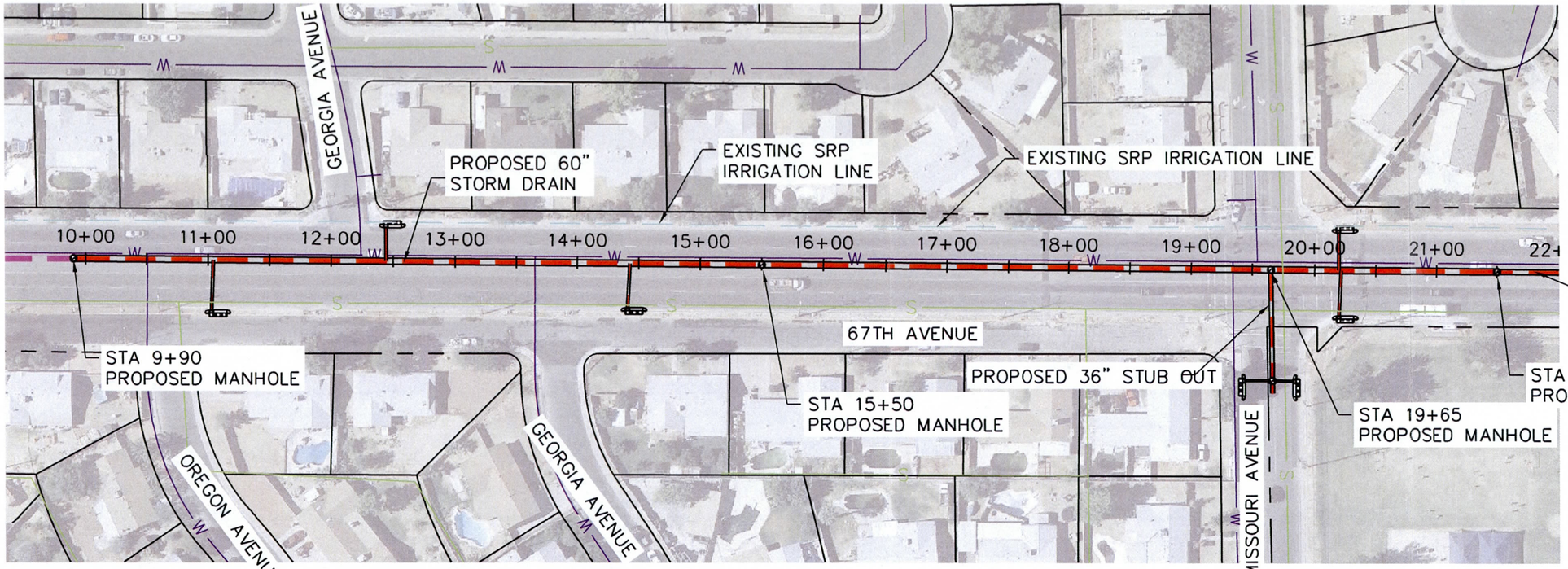
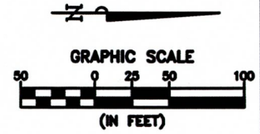
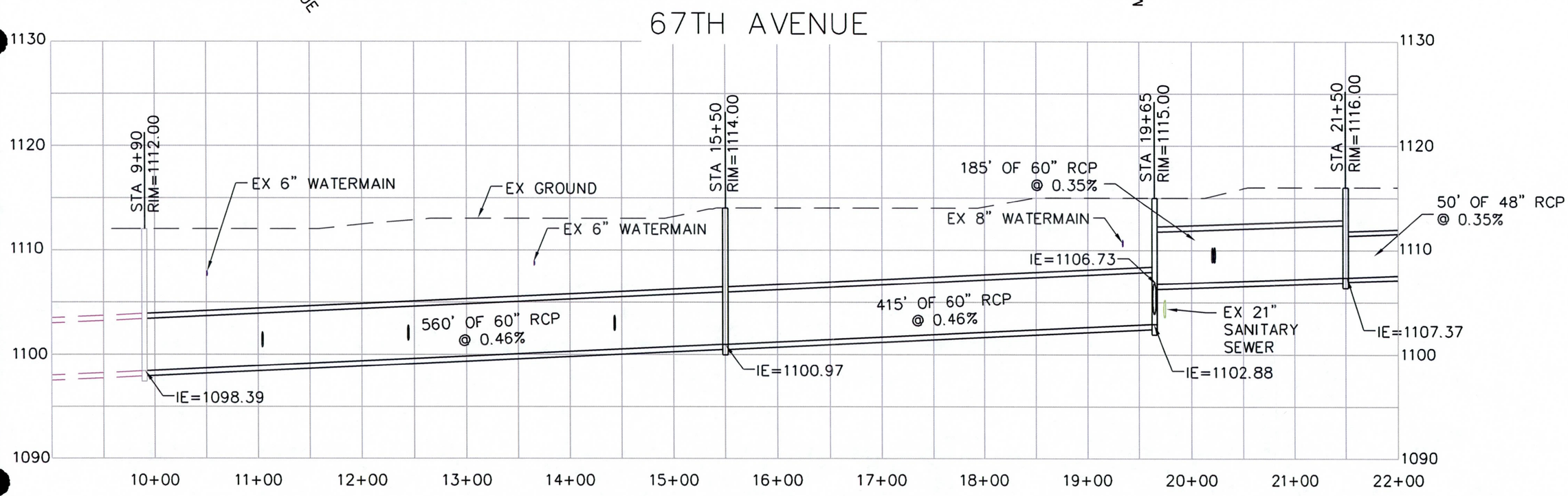
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
59TH AVENUE – CAMELBACK TO BETHANY HOME

PROJECT NO.
09191009

DRAWING NAME
0919100009PR38







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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
67TH AVENUE – CAMELBACK TO BETHANY HOME

PROJECT NO.
09191009

DRAWING NAME
0919100 09PR39

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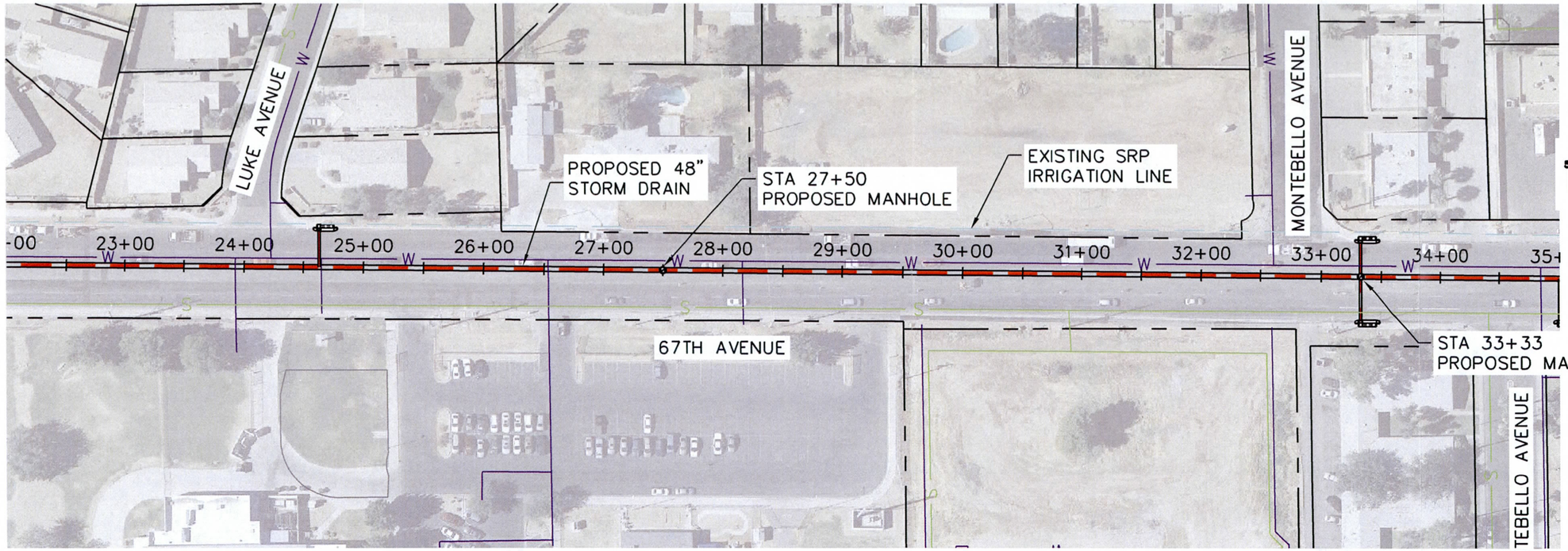
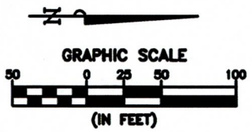
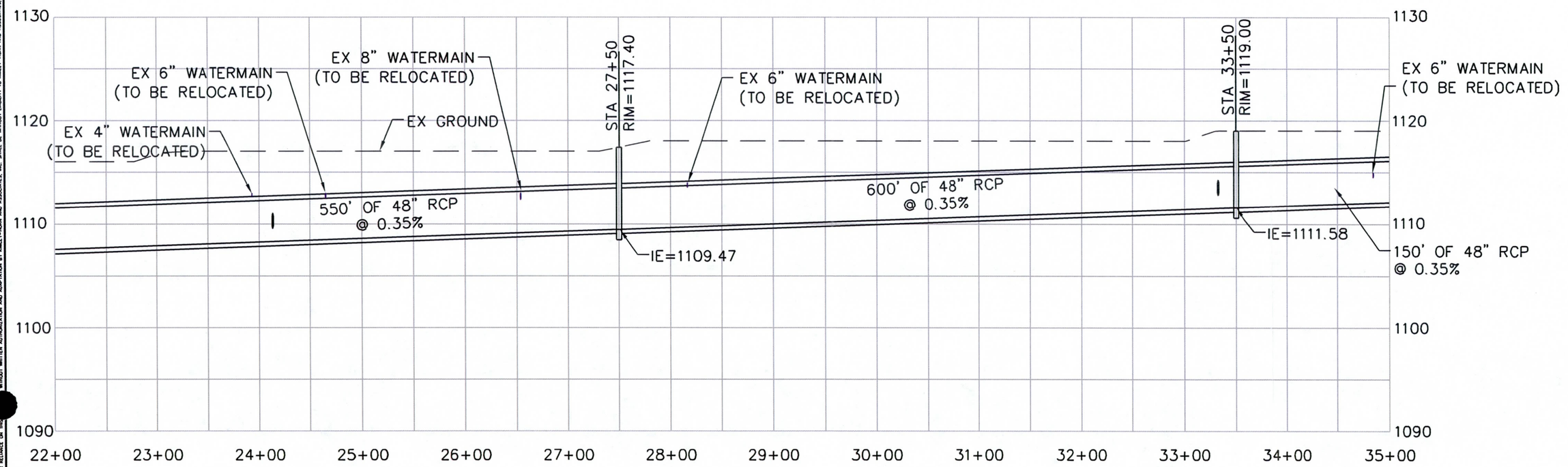




67TH AVENUE



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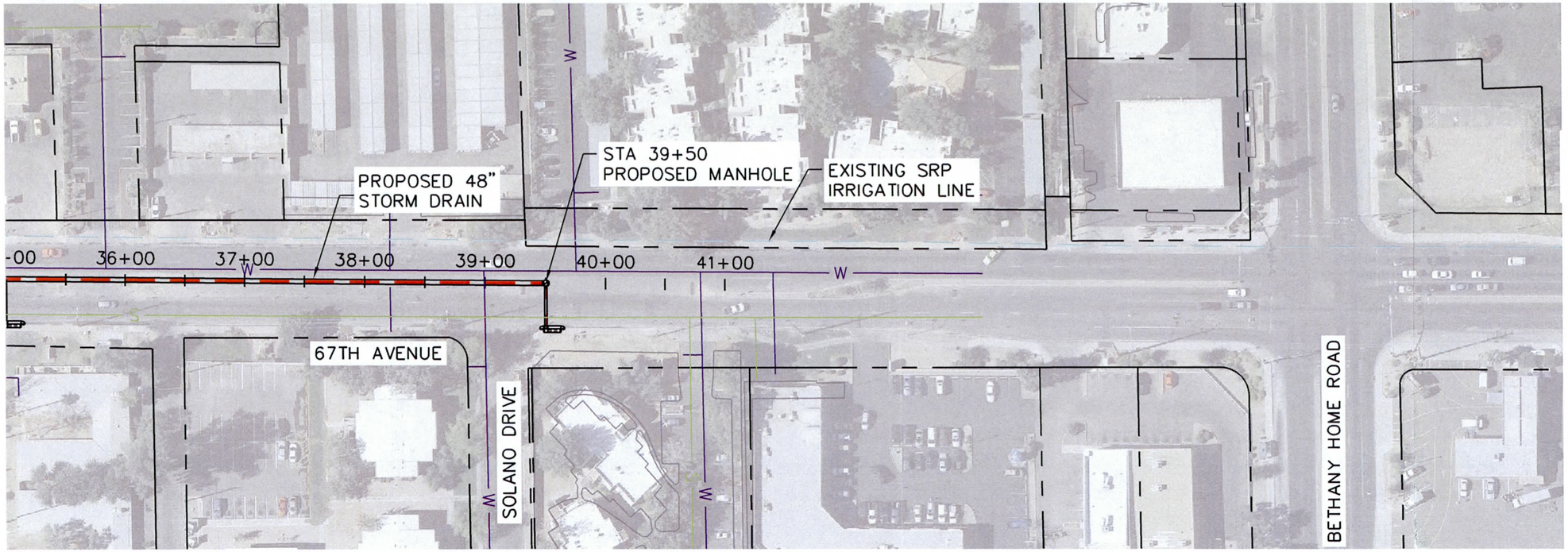
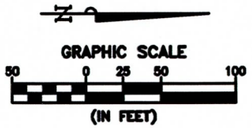
DRAWN BY: ZRS
CHECKED BY: DEJ
DATE: 07/12/2011

GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
67TH AVENUE – CAMELBACK TO BETHANY HOME

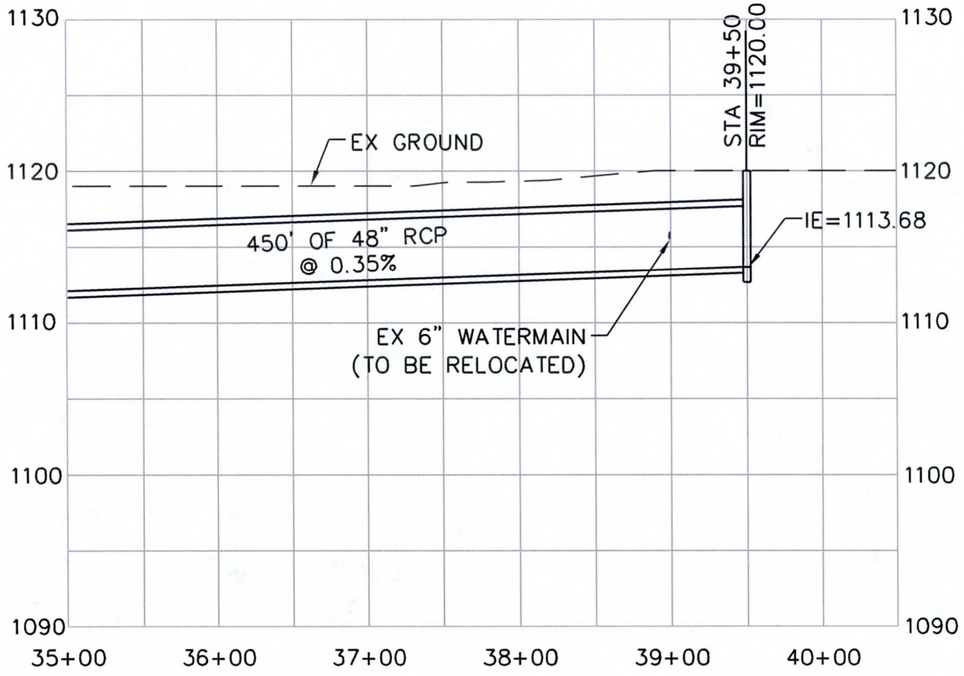
PROJECT NO.
09191009

DRAWING NAME
091910009PR40





67TH AVENUE



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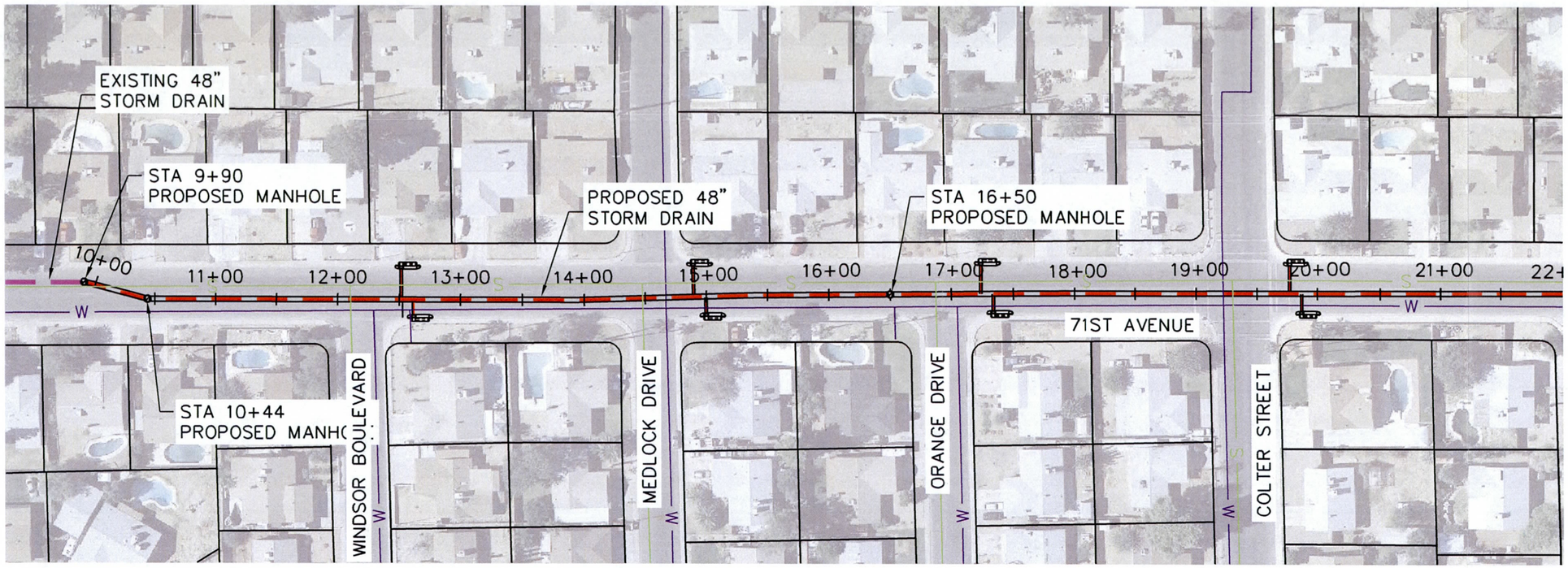
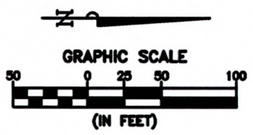
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
67TH AVENUE – CAMELBACK TO BETHANY HOME

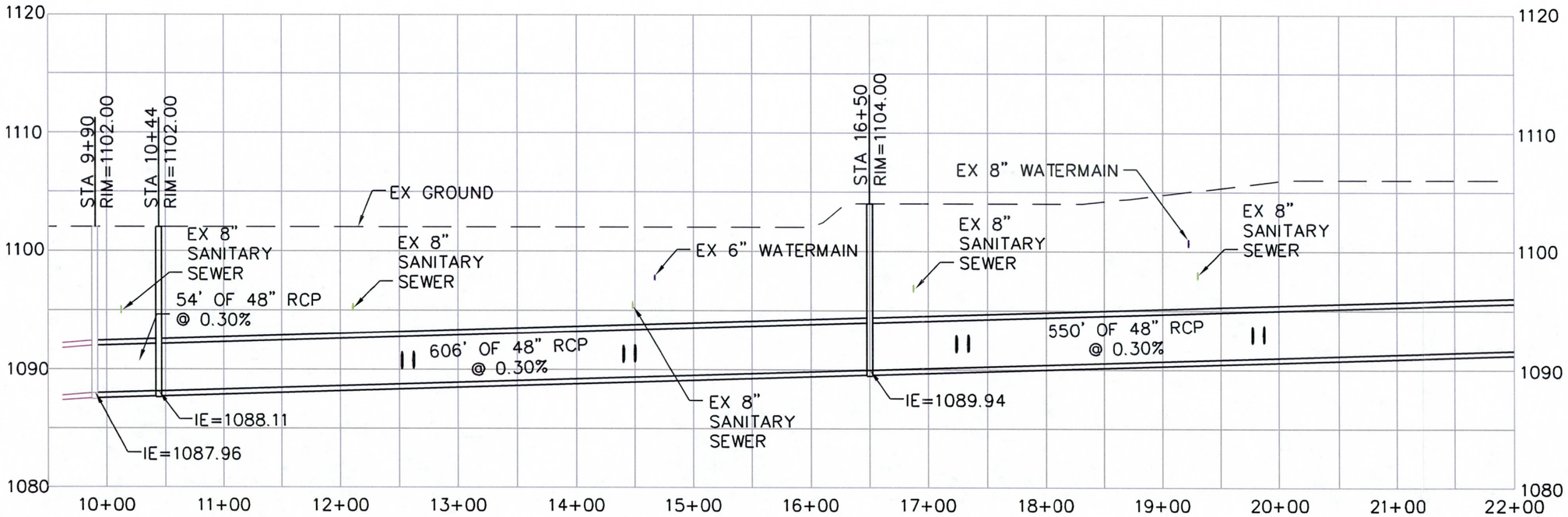
PROJECT NO.
09191009

DRAWING NAME
091910009PR41





71ST AVENUE



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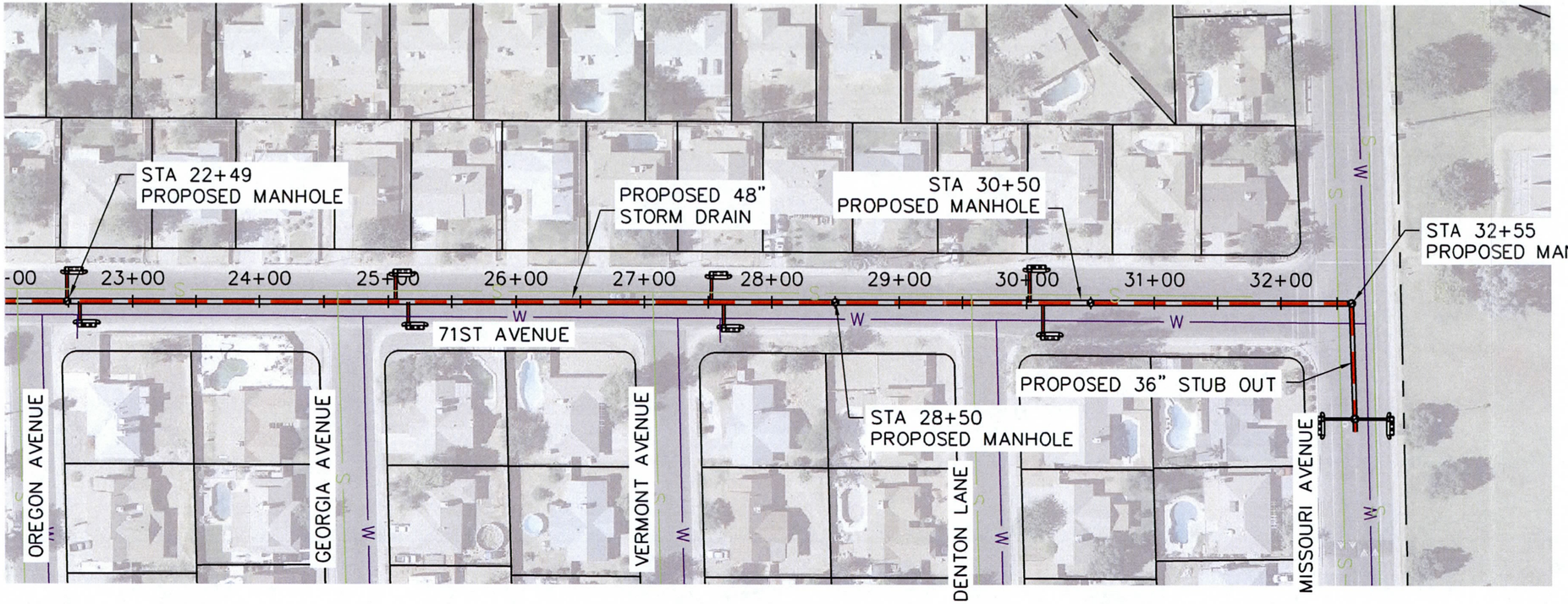
GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
71ST AVENUE AT CAMELBACK ROAD

PROJECT NO.
09191009

DRAWING NAME
091910009PR42



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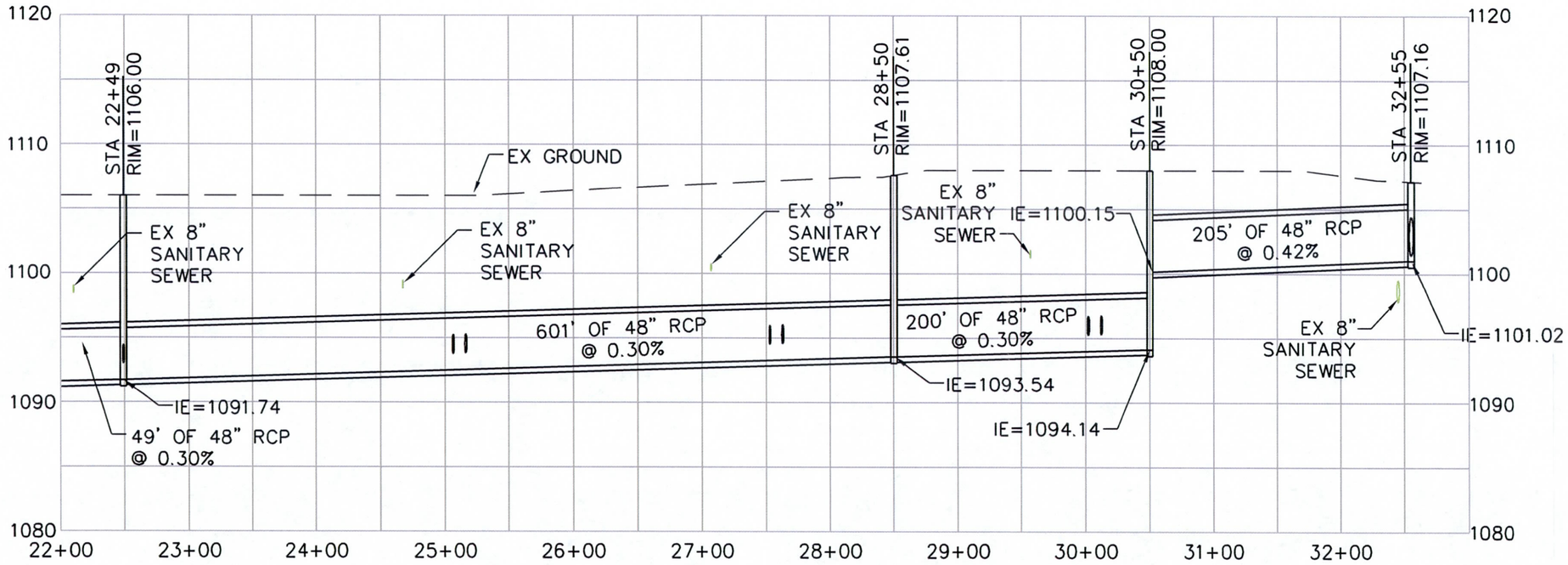

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
71ST AVENUE AT CAMELBACK ROAD

PROJECT NO.
09191009

DRAWING NAME
091910009PR43

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XREFS: v910009_Aerial 091910009PR
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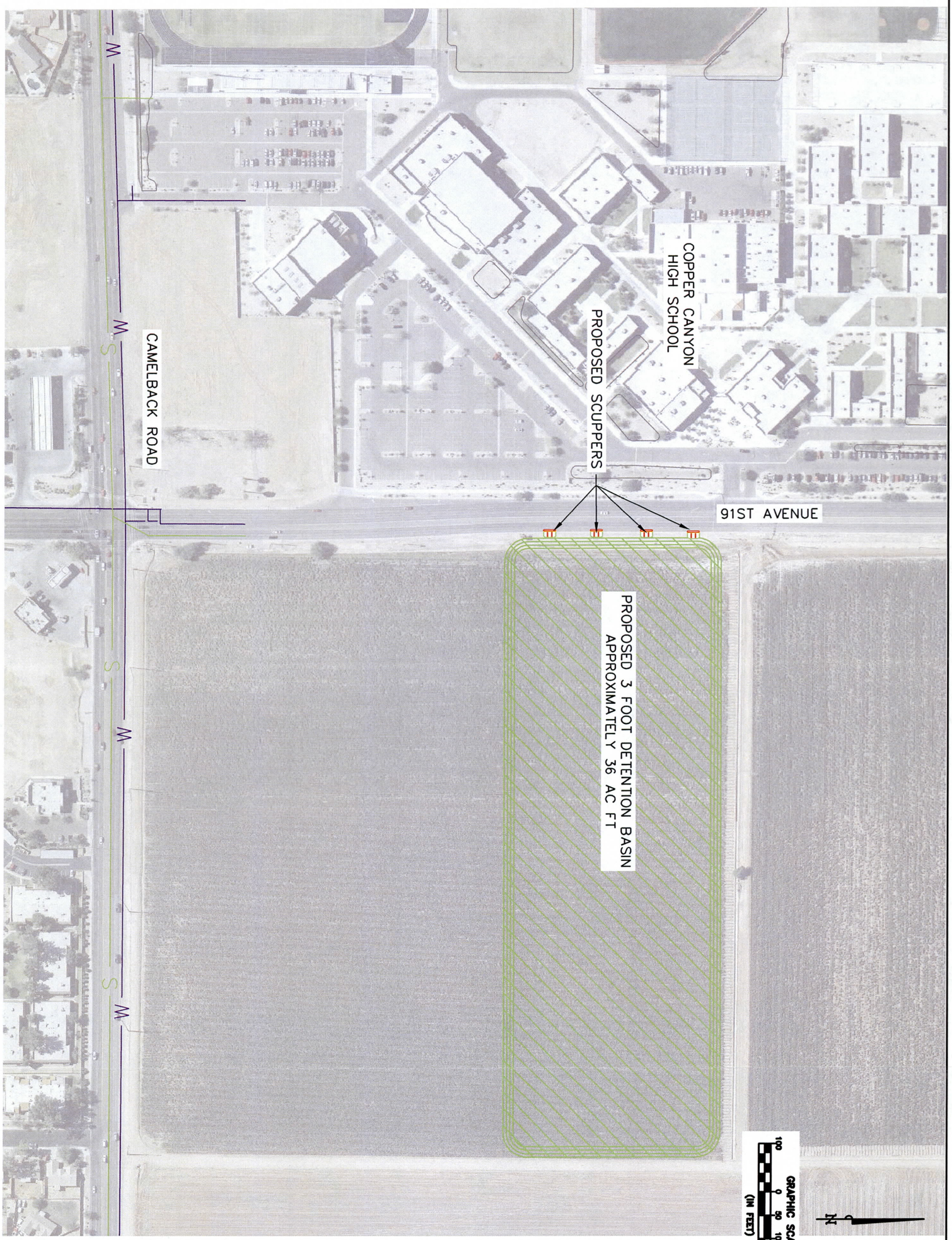

GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
91ST AVENUE AND CAMELBACK ROAD

SCALE (H): 1"=200'
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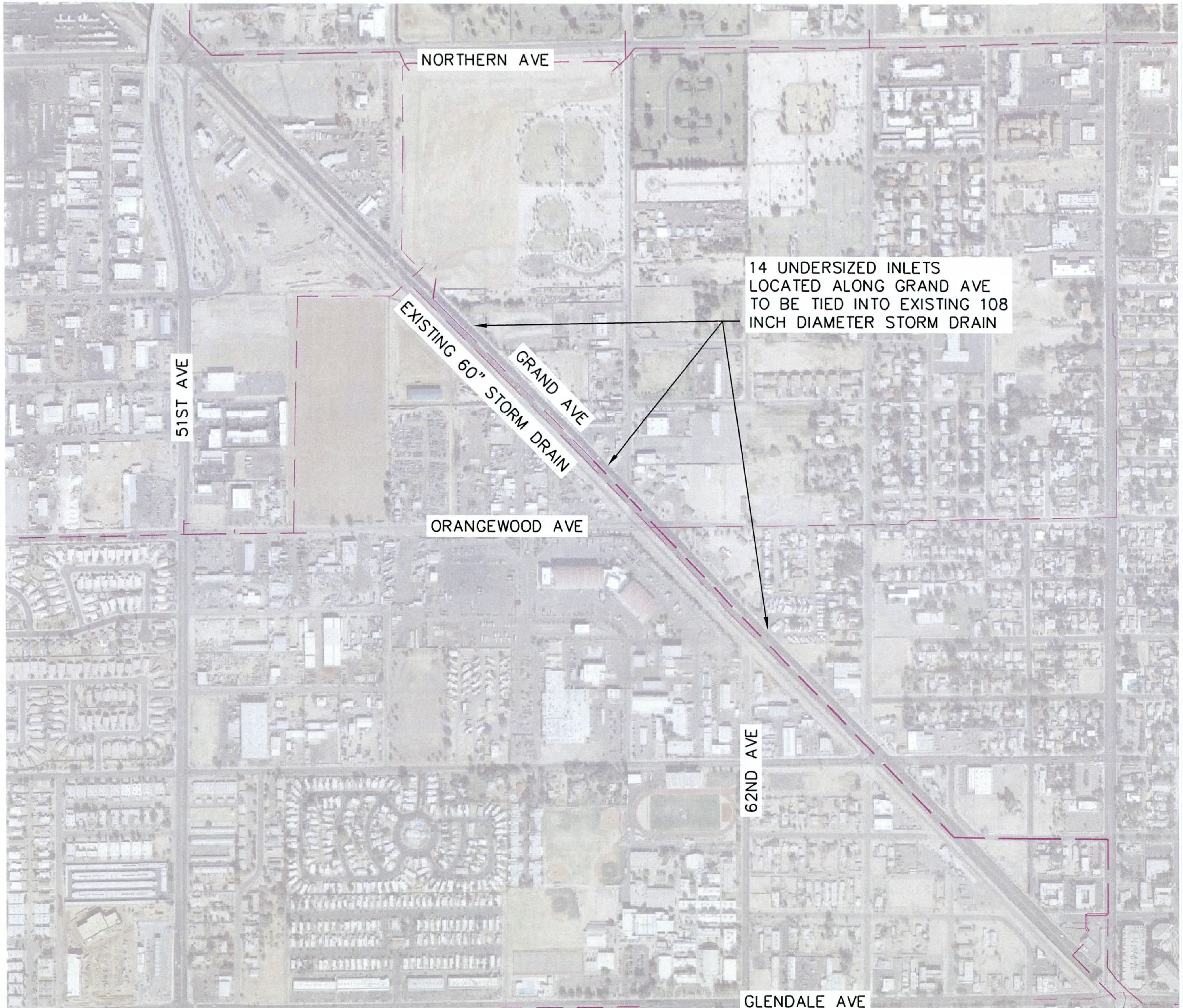
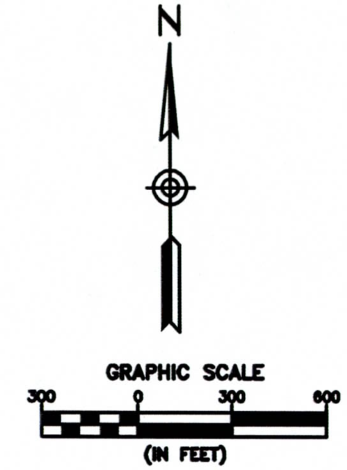
PROJECT NO. 091910009
DRAWING NAME 091910009PR44





NOTE; THIS PROJECT IS SCHEDULED TO BE DONE AS A PART OF THE GRAND AVENUE BEAUTIFICATION PROJECT

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
GRAND AVENUE INLETS

PROJECT NO. 09191009

DRAWING NAME 091910009PR45

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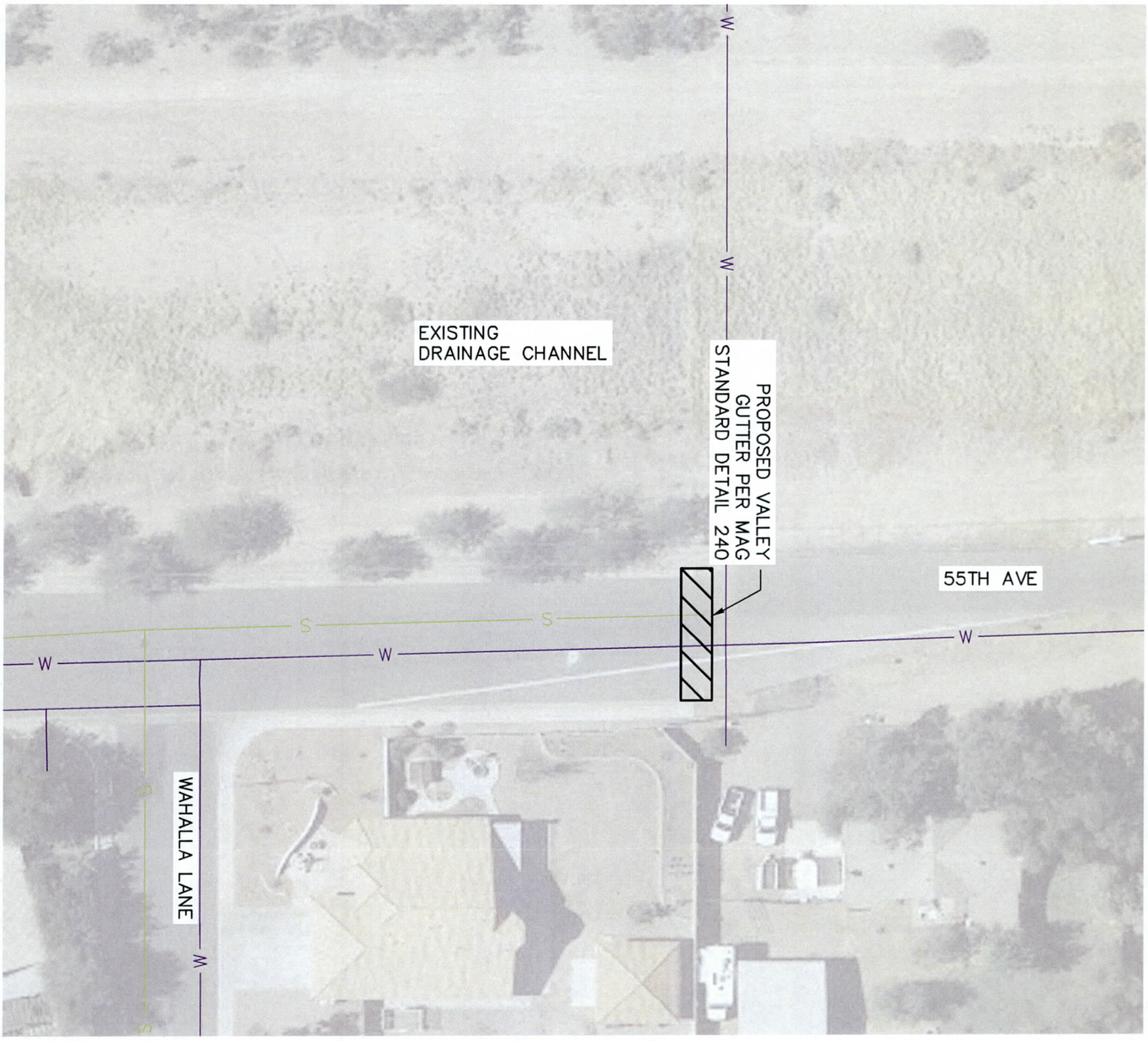
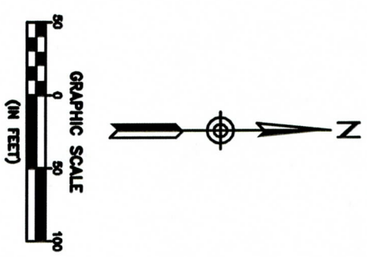
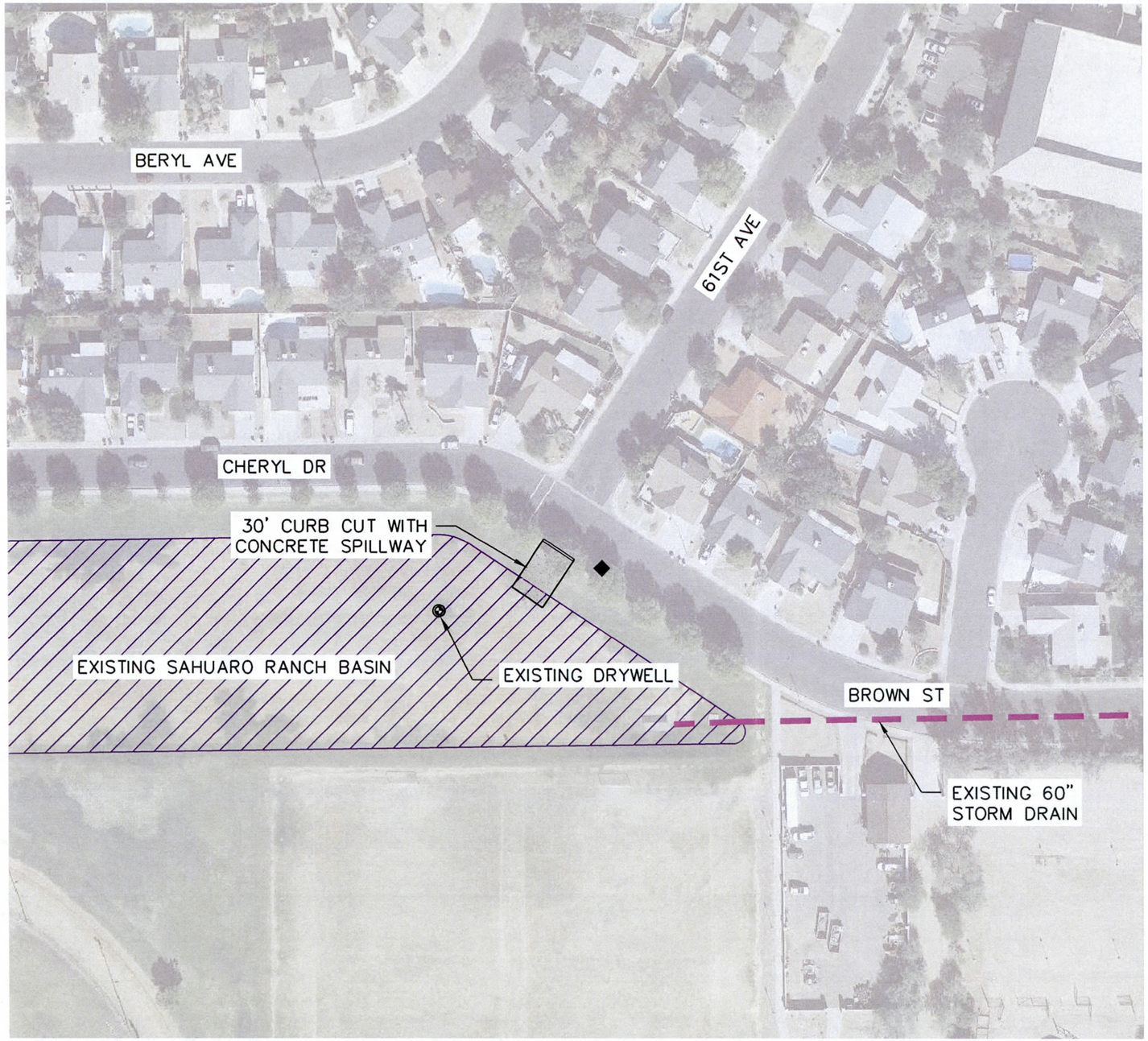




52 OF 54	DRAWING NAME: 091910009PR46	PROJECT NO.: 091910009	GLENDALE AREA STORMWATER MANAGEMENT PLAN CITY OF GLENDALE RECOMMENDED PLANS BEARDSLEY ROAD AND 55TH AVENUE	SCALE (H): 1"=100' SCALE (V): NONE DESIGNED BY: ZRS DRAWN BY: ZRS CHECKED BY: DEJ DATE: 07/12/2011	Kimley-Horn and Associates, Inc. © 2011 KIMLEY-HORN AND ASSOCIATES, INC. 7878 North 16th Street, Suite 300 Phoenix, Arizona 85020 (602) 944-5500	NO. REVISION DATE



N

GRAPHIC SCALE
50 0 50 100
(IN FEET)

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SCALE (V): NONE
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DATE: 07/12/2011

GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
61ST AVENUE AND SAHUARO RANCH PARK

PROJECT NO.
09191009

DRAWING NAME
091910009PR47

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XREFS: 091910009PR #1 (XDWG #1).dwg
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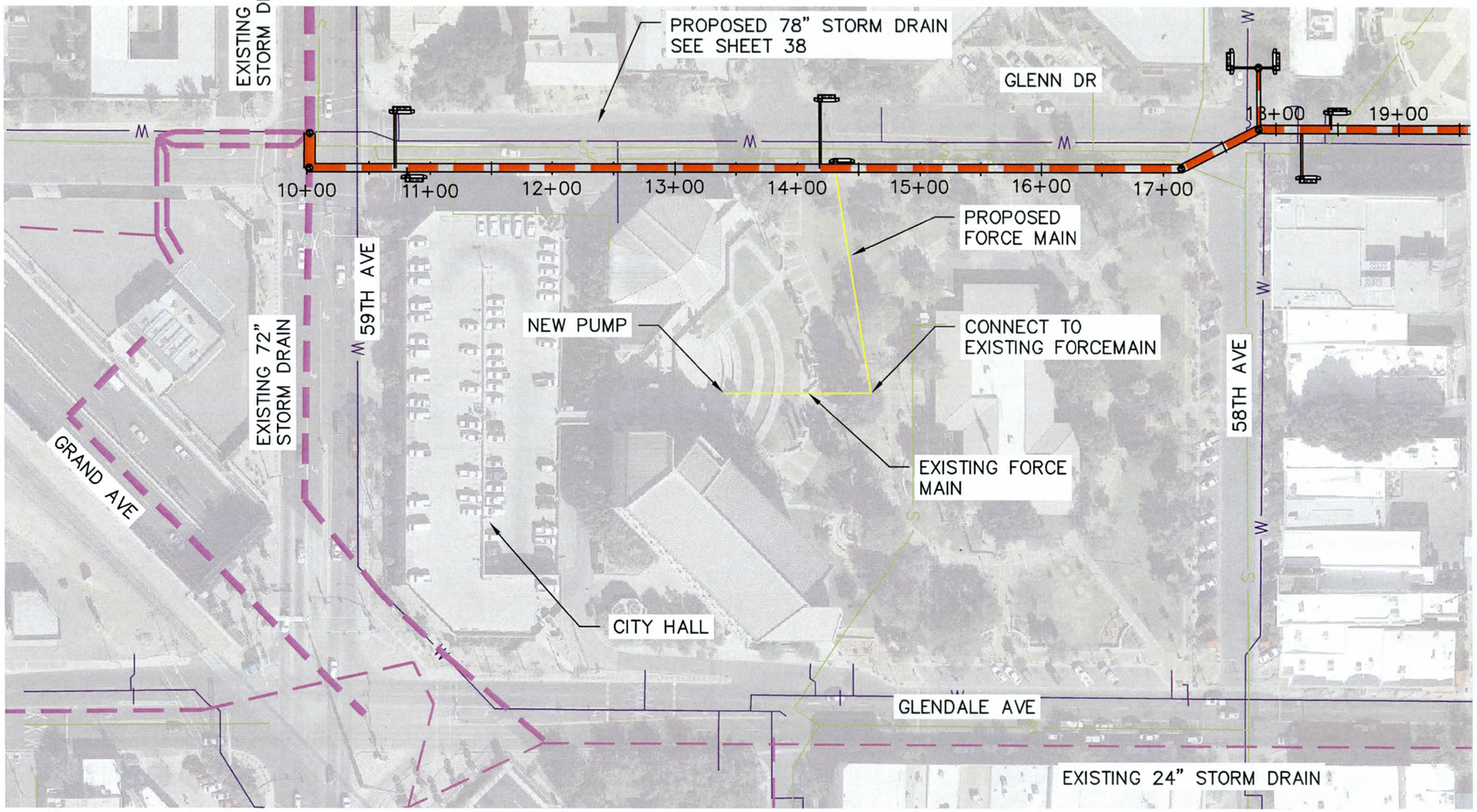

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GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLANS
GLENDALE AMPHITHEATRE

PROJECT NO.
09191009

DRAWING NAME
091910009PR48

K:\PHX_WaterResource_09191009\09191009\CADD\091910009PR48.dwg Jul 18, 2011 zachary.schmidt
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BY AND UNPROPER

13.0 References

1. ADOT. *State Highway Wickenburg-Phoenix Highway (US 60), Grand Ave: 59th-Glendale Ave*. Prepared by Baker. 2004.
2. ADOT. *State Highway Wickenburg-Phoenix Highway (US 60), Grand Ave at 43rd Ave and 51st Ave*. Prepared by Baker. 2006.
3. City of Glendale. *Bethany Home Road Storm Drain, 79th Avenue to 71st Avenue* 30% Preliminary plans. Plot date January 2010.
4. City of Glendale. *Determination of Mapping and Flood Zone Changes and Elevation Certificates, Three Floodplain Locations along Grand Avenue, One Floodplain Location along Grand Canal, Technical Data Notebook.* Project Engineering Consultants, Ltd. September 2008.
5. City of Glendale. *Engineering Standards*. 2002.
6. City of Glendale. GIS storm drain shapefiles. Received March 19, 2009.
7. City of Glendale. *Glen Burton Detention Basin* As-built records. 1990.
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9. City of Glendale. *Orangewood Ave Storm Drain Sub-Phase "C" Contract fcd 99-07 Phase II* As-built records. Prepared by Wood, Patel, and Associates, Inc. 1980.
10. City of Glendale. *Plans for the Construction of Camelback Road Storm Drain, 59th Avenue to 75th Avenue* 100% Plans.
11. City of Glendale. *Project No. 012018 Retention Basin – 47th Ave and Grand Ave.* Prepared by DEI Professional Services, LLC. 2002.
12. City of Glendale. *Rose Lane Park Drainage Detention Basin* As-built plan. 1991.
13. City of Glendale. *Standard Details*. 2002.
14. City of Glendale. *Sahuaro Ranch Park – Phase VI* Civil Survey. 1988.
15. City of Peoria. GIS storm drain shapefiles. Received August 10, 2009.
16. City of Phoenix. GIS storm drain shapefiles. Received August 21, 2009.
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18. FCDMC. *Drainage Policies and Standards for Maricopa County, Arizona*. September 2009.

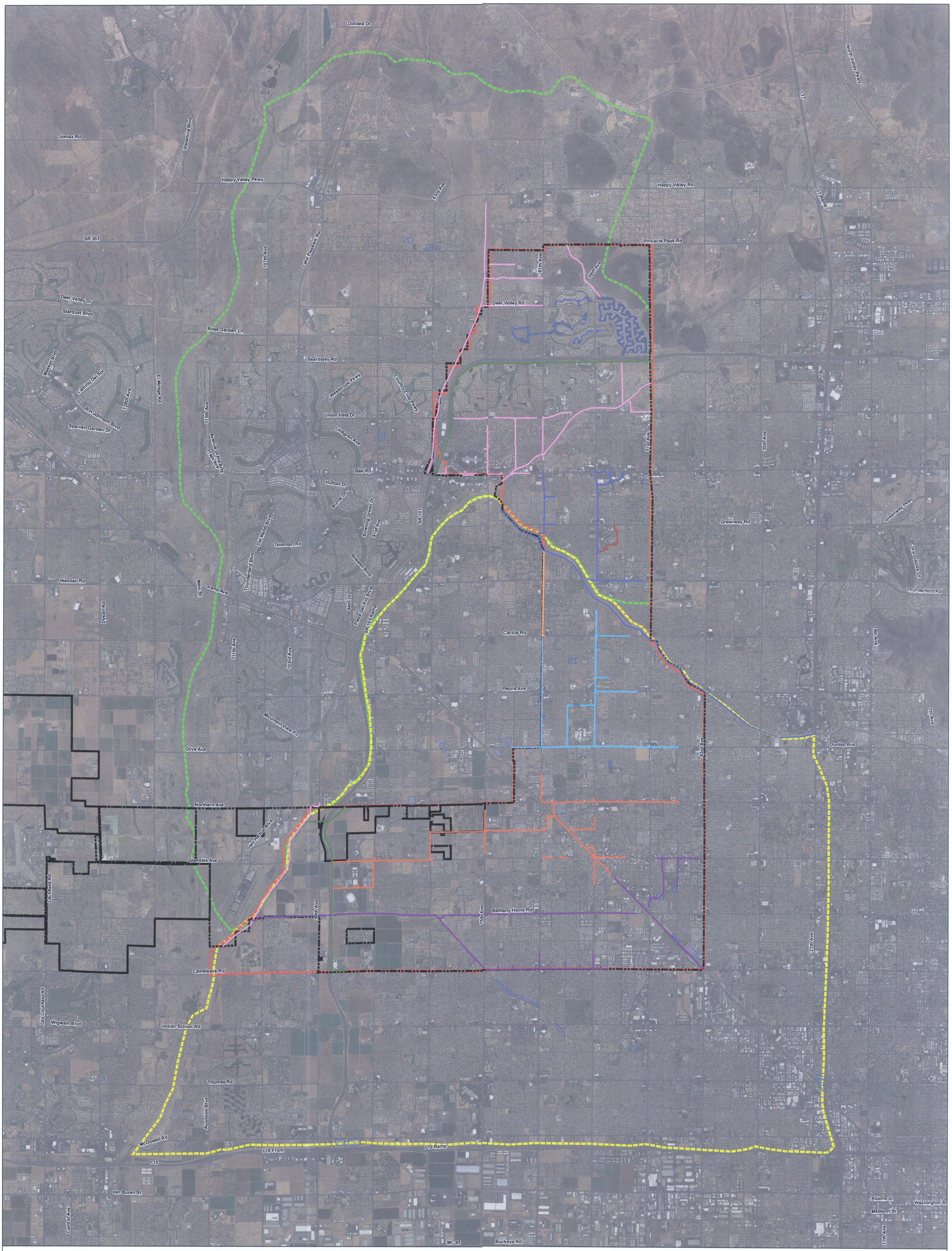
19. FCDMC. GIS shapefiles including soils and MAG landuse, DTM data and orthophotographic tiles in electronic format for the project area. Extracted from the database July 24, 2009.

20. FCDMC. *Glendale/Peoria Area Drainage Master Plan Update Hydrology Report*. Prepared by Entellus. May 30, 2001.

21. FCDMC. *Maryvale Area Drainage Master Study Hydrology*. Prepared by Wood, Patel & Associates, Inc. February 1997.

22. FCDMC. *Northern and Butler Storm Drains Sub-Phase "A" Phase II* As-built records. Prepared by Wood, Patel, and Associates, Inc. 2001.

Appendix A Exhibits



Legend

- ADOT Drainage Channel
- Arizona Canal Diversion Channel
- Bethany Home Outfall Channel
- Cactus Storm Drain
- Glendale/Orangewood Storm Drain
- Misc Glendale Channels
- Olive Storm Drain
- Skunk Creek/New River
- Regional Basins
- City Limits
- 1986 Glendale Stormwater Master Plan Boundary
- 1997 Marvale Master Plan Boundary
- 2001 Master Plan Boundary

N

0 2,000 4,000 8,000 Feet

Source: Aerial Express 2009

SHEET 1 OF 1

DRAWING NAME
SYSTEM DESCRIPTION

PROJECT NO.
091910009

Registered Professional Engineer (Civil)
CERTIFICATE NO.
36892
DAVID E. JENSEN
Date Signed 1/18/13
ARIZONA U.S.A.

EXPIRES 9/30/2013

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 1 CITY OF GLENDALE STORM DRAIN SYSTEMS

SCALE(H): 1"= 4000'
SCALE(V): NONE

DESIGNED BY: ZRS
DRAWN BY: ZRS
CHECKED BY: DEJ

DATE: JULY 2011

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Engineering, Planning and Environmental Consultants
7878 North 16th Street, Suite 300
Phoenix, Arizona 85020 (602) 944-5500

Source: FCDMC Aerials 10/28/2008 - 12/21/2008

0 1,000 2,000 4,000 Feet

Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
GNAF Regional Detention Basin Name

SHEET 01 OF 04

DRAWING NAME: EXHIBIT_02_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO.: 091910009

Registered Professional Engineer (Civil) CERTIFICATE NO. 36852 DAVID E. JENSEN Date Signed 1/31/2011 ARIZONA U. S. A.

EXPIRES 9/30/2013

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. SUBBASIN DELINEATION MAP

SCALE(H): 1"= 2000'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM

DATE: JUNE, 2011

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Source: FCDMC Aerials 10/28/2008 - 12/21/2008

0 1,000 2,000 4,000 Feet

Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
CNAF Regional Detention Basin Name

SHEET 02 OF 04

DRAWING NAME: EXHIBIT_02_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO. 091910009

Registered Professional Engineer (Civil) CERTIFICATE NO. 36852 DAVID E. JENSEN Date Signed 9/30/2013 ARIZONA U.S.A.

EXPIRES 9/30/2013

GLENDALE AREA STORMWATER MANAGEMENT PLAN EXHIBIT 2. SUBBASIN DELINEATION MAP

SCALE(H): 1"= 2000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: JUNE, 2011

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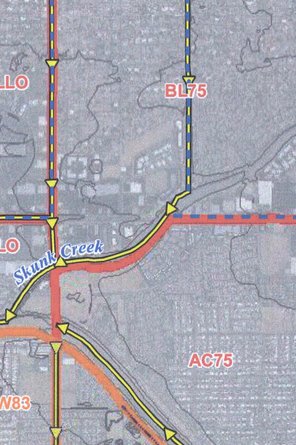
GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 2. SUBBASIN DELINEATION MAP

Source: FCDMC Aerials 10/28/2008 - 12/21/2008

0 1,000 2,000 4,000 Feet



Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
CNAF Regional Detention Basin Name

SHEET 03 OF 04
DRAWING NAME: EXHIBIT_02_SUBBASIN DELINEATION_MAP.MXD
PROJECT NO. 091910009

Registered Professional Engineer (Civil) CERTIFICATE NO. 36852 DAVID E. JENSEN Date Signed 1/18/13 ARIZONA U. S. A.
EXPIRES 9/30/2013

SCALE(H): 1"= 2000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: JUNE, 2011

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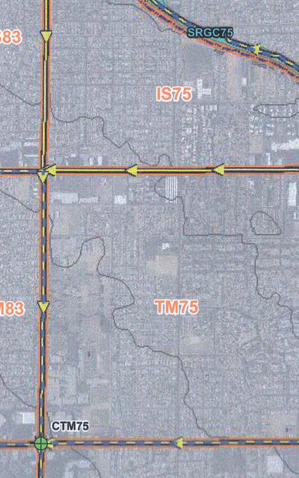
Source: FCDMC Aerials 10/28/2008 - 12/21/2008

0 1,000 2,000 4,000 Feet



Legend

- Regional Detention Basins
- 10 ft Contours
- Canal/Channel
- Railroad
- Concentration Point
- Surface Routing
- Time of Concentration Flow Paths

Subbasin Boundaries

- Glendale/Peoria ADMPU
- Maryvale ADMS

INO7 Subbasin Name
CNAF Concentration Point Name
CNAF Regional Detention Basin Name

SHEET 04 OF 04

DRAWING NAME: EXHIBIT_02_SUBBASIN DELINEATION_MAP.MXD

PROJECT NO. 091910009

Registered Professional Engineer, Civil
CERTIFICATE NO. 36852
DAVID E. JENSEN
Date Signed 7/18/2011
ARIZONA U. S. A.
EXPIRES 9/30/2013

GLENDALE AREA STORMWATER MANAGEMENT PLAN
EXHIBIT 2. SUBBASIN DELINEATION MAP

SCALE(H): 1"= 2000'
SCALE(V): NONE
DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: AOM
DATE: JUNE, 2011

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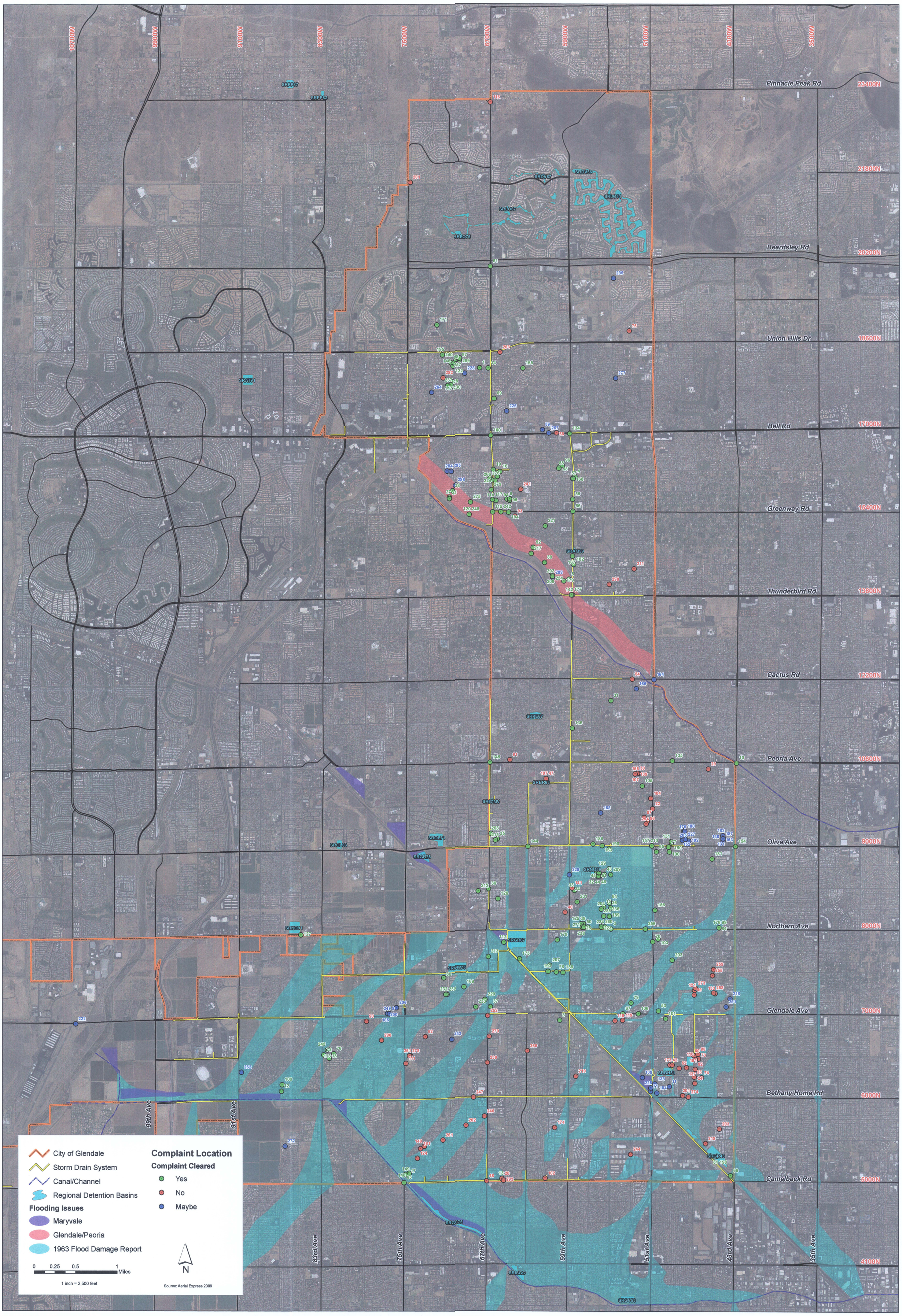

DRAWING NAME: EXHIBIT_3_FLOODING_ISSUES.MXD

PROJECT NO. 091910009

Registered Professional Engineer (Civil) CERTIFICATE NO. 36852 DAVID E. JENSEN Date Signed 7/19/11 ARIZONA U.S.A.

EXPIRES 9/30/2013

CITY OF GLENDALE
HISTORIC FLOODING ISSUES
EXHIBIT 3

SCALE(H): 1"= 2000'
SCALE(V): NONE

DESIGNED BY: DAS
DRAWN BY: JAG
CHECKED BY: DAS

DATE: JULY 2011

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Legend

City of Glendale

Drainage Issues

Local

Regional

Regional

N

0 0.25 0.5 1 Miles

1 inch = 2,500 feet

Source: Aerial Express 2009

Pinnacle Peak Rd

Beardsley Rd

Union Hills Dr

Bell Rd

Greenway Rd

Thunderbird Rd

Cactus Rd

Peoria Ave

Olive Ave

Northern Ave

Glendale Ave

Bethany Home Rd

Camelback Rd

99th Ave

91st Ave

83rd Ave

75th Ave

67th Ave

59th Ave

51st Ave

43rd Ave

35th Ave

Figure 20

Figure 04

Figure 02

Figure 21

Figure 03

Figure 24

Figure 05

Figure 08

Figure 07

Figure 06

Figure 18

Figure 16

Figure 17

Figure 19

Figure 22

Figure 23

Figure 10

Figure 09

Figure 15

Figure 12

Figure 11

Figure 13

Figure 14

DRAWING NAME
EXHIBIT_4_DRAINAGE_ISSUES_MAP.MXD

PROJECT NO.
091910009

Registered Professional Engineer
CERTIFICATE NO.
36852
DAVID E. JENSEN
Date Signed 7/19/2013
ARIZONA U.S.

EXPIRES 9/30/2013

GLENDALE AREA
STORMWATER MANAGEMENT PLAN
EXHIBIT 4 DRAINAGE ISSUES LOCATION MAP

SCALE(H): 1"= 2500'
SCALE(V): NONE

DESIGNED BY: MAF
DRAWN BY: JAG
CHECKED BY: DEJ

DATE: JUNE 2011

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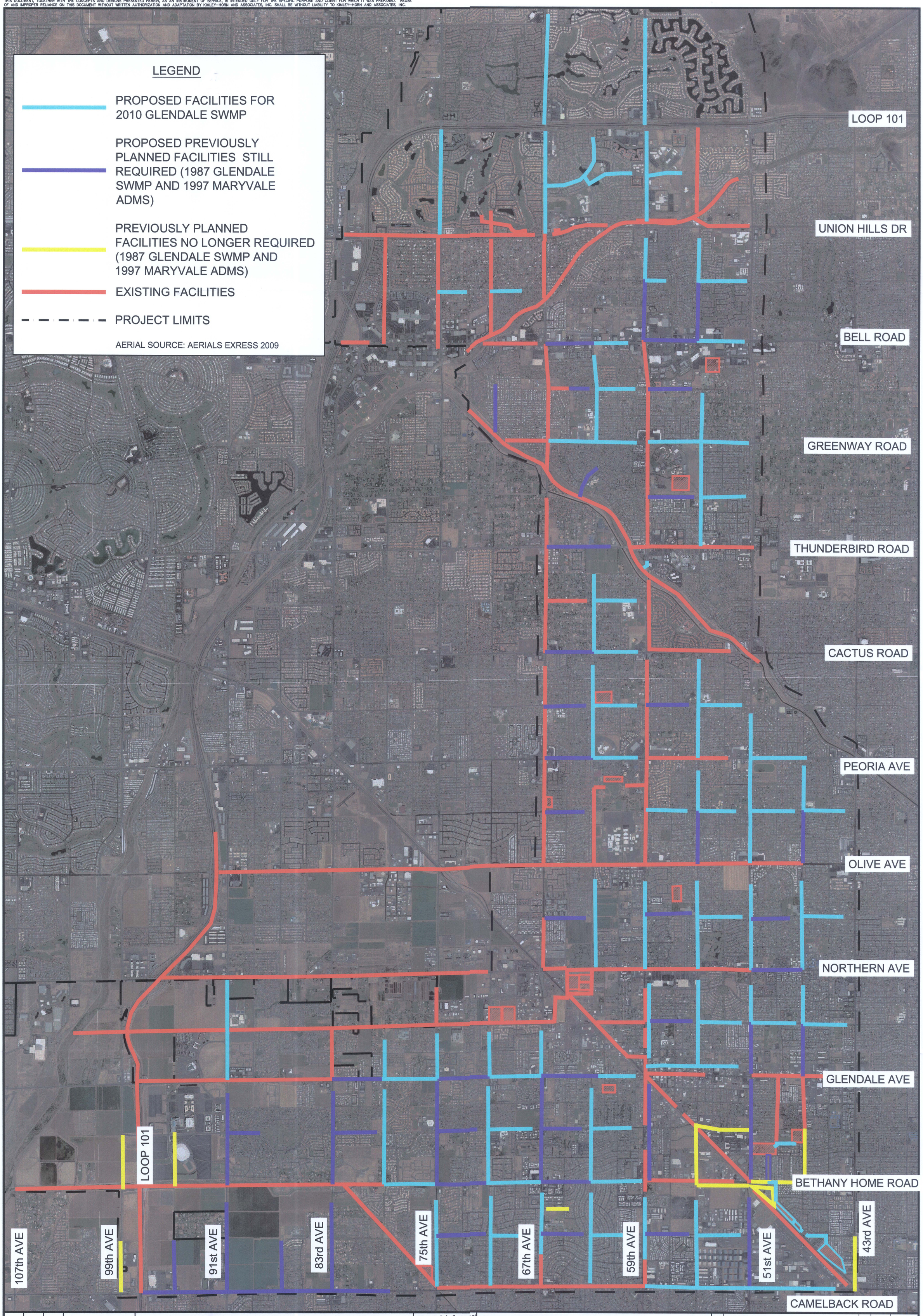

1 OF 1

PROJECT NO. 091910009

DRAWING NAME EXHIBIT 5

GLENDALE AREA STORMWATER MANAGEMENT PLAN
CITY OF GLENDALE
RECOMMENDED PLAN COMPARISON
EXHIBIT 5

SCALE (H):1"=2000'
SCALE (V): NONE

DESIGNED BY: ZR$
DRAWN BY: ZR$
CHECKED BY: RAF

DATE: 8/2011

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NO.	REVISION	BY	DATE	APPR.

Appendix B Data Collection Log

	Document	Description	Author	Project Location	Format	Type	Date Received	Date of Document	Received From	Comments	Location (linked)
1	Electronic Information for the City of Glendale	Land use, streets, storm drain, detention ponds, floodplains, and contour information for the city of Glendale	City of Glendale	City of Glendale city limits	Electronic	.dwg, .shp	03/19/09	03/19/09	City of Glendale		From_COG_3.19.08
2	DR-100.pdf	67th Avenue Street Improvements Drainage Report	Stanley Consultants	67th Avenue Arizona Canal to Bell Road	Electronic	PDF	03/19/09	11/19/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-100.PDF
3	DR-101.pdf	Bethany Home Road Street and Storm Drain Improvements Preliminary Drainage Report	Stanley Consultants	Bethany Home Road 58th Avenue to 83rd Avenue	Electronic	PDF	03/19/09	02/16/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-101.PDF
4	DR-102.pdf	Drainage Study and Conceptual Design	Dooley-Jones & Associates, Inc.	Vicinity of 107th Ave, RID Canal to Bethany Home Road	Electronic	PDF	03/19/09	08/14/85	City of Glendale		From_COG_3.19.08\DrainageReports\DR-102.PDF
5	DR-103.pdf	Glendale Storm Water Management Plan	Camp Dresser & McKee, Inc.	to the north, Pinnacle Peak Road; to the east, 51st and 43rd Avenues; to the south, Camelback Road; and along the western perimeter, New River, Northern Avenue, 67th Avenue, the Arizona Canal, and New River again at the northwestern corner	Electronic	PDF	03/19/09	01/02/86	City of Glendale		From_COG_3.19.08\DrainageReports\DR-103.PDF
6	DR-104.pdf	Initial Drainage Report for Proposed Union Hills Bridge at New River	HDR Engineering, Inc.	Union Hills Drive and 83rd Avenue crossings of New River	Electronic	PDF	03/19/09	04/10/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-104.PDF
7	DR-105.pdf	Drainage Report for City of Glendale Improvement District No. 59	Burgess & Niple, Inc.	City of Glendale Improvement District No. 59	Electronic	PDF	03/19/09	01/16/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-105.PDF
8	DR-106.pdf	Design Data Report for the Cactus Road Storm Drain	Stanley Franzoy Core (SFC) Engineering Compay	67th Avenue to the Agua Fria Freeway	Electronic	PDF	03/19/09	06/25/92	City of Glendale		From_COG_3.19.08\DrainageReports\DR-106.PDF
9	DR-107.pdf	Drainage Preport Supplement Adjacement Parcels 'A' and 'G' Arrowhead Towne Center	Val-Tec, Inc.	Arrowhead Towne Center	Electronic	PDF	03/19/09	10/07/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-107.PDF
10	DR-108.pdf	Bethany Home/Grand Canal Flood Control Project Bethany Home Outfall Channel	DMJM+Harris	SR101L to 83rd Avenue	Electronic	PDF	03/19/09	09/10/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-108.PDF
11	DR-109.pdf	Final Drainage Report for Westgate Phase 1	David Evans and Associates, Inc.	Westgate is located within Section 9, Township 2 North, Range 1 East of the Salt River and Gila River Base and Meridian.	Electronic	PDF	03/19/09	08/31/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-109.PDF
12	DR-110.pdf	CLOMR Application and Hydraulic Analysis for Wyndham Place	Clouse Engineering, Inc.	The development is located within the City of Glendale and is situated at the southeast corner of the intersection of 75th Avenue and Pinnacle Peak Road.	Electronic	PDF	03/19/09	05/03/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-110.PDF
13	DR-111.pdf	Floodplain and Floodway Delineation Study for Chelsea Villiage and CLOMR Application	Clouse Engineering, Inc.	located within the City of Glendale and lies approximately 0.2 miles north of Union Hills Drive with 51st Avenue bordering on the east and Skunk Creek Wash bordering on the northwest.	Electronic	PDF	03/19/09	06/16/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-111.PDF
14	DR-112.pdf	CLOMR to LOMR Supplemental Data for Camelback Ranch Levee North	FCDMC	Camelback Ranch Levee North and Glendale Airport Levee	Electronic	PDF	03/19/09	03/21/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-112.PDF
15	DR-113.pdf	Orangewood Avenue Storm Drain Sub-Phase "C"	Wood, Patel & Associates, Inc.	Orangewood Avenue	Electronic	PDF	03/19/09	03/29/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-113.PDF
16	DR-114.pdf	Initial Drainage Report Grand Avenue Underpass at 59th Avenue and Glendale Avenue	Michael Baker Jr., Inc.	Underpass at 59th Avenue and Glendale Avenue	Electronic	PDF	03/19/09	07/01/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-114.PDF
17	DR-115.pdf	Drainage Design Report 59th Avenue Paving Improvements	Stantec Consulting, Inc.	59th Avenue from Deer Valley Road to Pinnacle Peak Road	Electronic	PDF	03/19/09	05/04/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-115.PDF
18	DR-116.pdf	Drainage Report for South One-Half of Maryland Avenue	CMX, LLC	95th Avenue to 91st Avenue	Electronic	PDF	03/19/09	09/26/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-116.PDF
19	DR-117.pdf	Final Drainage Report for The Arizona Cardinals Stadium Site	CMX, LLC	Maryland Avenue and 95th Avenue, Glendale, AZ	Electronic	PDF	03/19/09	08/22/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-117.PDF
20	DR-118.pdf	TSA/Cardinals Multipurpose Facility Hydrology & Concept Drainage Report	DMJM+Harris	site is located within the south half of Section 9, Township 2 North, Range 1 East of the Gila and Salt River Baseline & Meridian.	Electronic	PDF	03/19/09	04/28/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-118.PDF
21	DR-119.pdf	Initial Drainage Report 67th Ave. - Peoria Ave. to Cactus Road	Entranco	67th Aveue from Peoria Ave. to Cactus Road	Electronic	PDF	03/19/09	03/09/93	City of Glendale		From_COG_3.19.08\DrainageReports\DR-119.PDF
22	DR-120.pdf	Addendum to Final Drainage Report Westgate Phase 1	David Evans and Associates, Inc.	The Westgate project site is located within Section 9, Township 2 North, Range 1 East of the Salt River and Gila River Base and Meridian	Electronic	PDF	03/19/09	08/12/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-120.PDF
23	DR-121.pdf	Final Drainage Report for Compass Bank	Landform	67th Avenue and 101 Freeway at The Village at Arrowhead	Electronic	PDF	03/19/09	05/07/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-121.pdf
24	DR-122.pdf	Drainage Report for Office Warehouse Parcels 4-6 West Frier Drive Northern Industrial Center	Morea-Hall Engineering, Inc.	Parcels 4-6 West Frier Drive Northern Industrial Center	Electronic	PDF	03/19/09	02/09/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-122.pdf
25	DR-123.pdf	Drainage Report for Cholla Cove	AEC Consultants, Inc.	Sunnyside Drive and 59th Avenue	Electronic	PDF	03/19/09	07/26/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-123.pdf
26	DR-124.pdf	Final Drainage Report for "Cobblefield"	Sage Engineering Corporation	Southwest corner of 75th Avenue and Maryland Avenue within the corporate limits of the City	Electronic	PDF	03/19/09	03/24/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-124.pdf
27	Dr-125.pdf	Drainge Report for City of Glendale Adult Center & Baptist Church	Gervasio & Associates, Inc.	Brown Street & 59th Avenue	Electronic	PDF	03/19/09	05/18/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-125.pdf
28	DR-126.pdf	Hydrology and Hydraulics Report for Coppercrest	Clouse Engineering, Inc.	Northeast corner of the intersection 63rd Avenue and Union Hills Drive	Electronic	PDF	03/19/09	10/11/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-126.pdf
29	DR-127.pdf	Final Drainge Report for Copper Ridge Estates	Civil Enterprise, Inc.	67th Avenue and Pinnacle Peak Road	Electronic	PDF	03/19/09	03/26/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-127.pdf
30	DR-128.pdf	Final Drainage Report for Glenadle Professional Building	Val-Tec, Inc.	Remainder Parcel "E" Arrowhead Mall	Electronic	PDF	03/19/09	05/18/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-128.pdf
31	DR-129.pdf	Final Drianage Report for Glendale Northwest	Norman Engineering Group, Inc.	South of Union Hills Drive between Auga Fria Freeway and 83rd Ave	Electronic	PDF	03/19/09	05/02/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-128.pdf
32	DR-130.pdf	Arrowhead Ranch Plaza Final drainage Report	Landmark Engineering, Inc.	South of Union Hills Drive, East of 59th Avenue	Electronic	PDF	03/19/09	01/16/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-130.pdf
33	DR-131.pdf	The Citadelle Final Drainage Report	Landmark Engineering, Inc.	NW Corner of 59th Avenue and Utopia Road	Electronic	PDF	03/19/09	12/02/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-131.pdf
34	DR-132.pdf	Drainage Report for Railway Spur Removal Project	DEI Professional Services	Area bounded by Glendale Aveune, Lamar Avenue, 55th Drive and 54th Avenue	Electronic	PDF	03/19/09	01/31/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-132.pdf
35	DR-133.pdf	Final Drainge Report for Glendale Northwest	Norman Engineering Group, Inc.	South of Union Hills Drive between Auga Fria Freeway and 83rd Ave	Electronic	PDF	03/19/09	12/22/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-133.pdf
36	DR-134.pdf	Floodplain Encroachment of Skunk Creek	Michael Baker Jr., Inc.	Skunk Creek east of 54th Avenue	Electronic	PDF	03/19/09	November 1995	City of Glendale		From_COG_3.19.08\DrainageReports\DR-134.pdf
37	DR-135.pdf	Final Drainage Report for San martin Apartments	RBF Consulting	Northwest forner of 67th Avenue and Ocotillo Road	Electronic	PDF	03/19/09	03/05/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-135.pdf
38	DR-136.pdf	Final Drainage Report for Burger King	Stantec Consulting, Inc.	5843 West Camelback Road	Electronic	PDF	03/19/09	01/05/05	City of Glendale	the report says 04 but the stamp says 05 - which is correct	From_COG_3.19.08\DrainageReports\DR-136.pdf
39	DR-137.pdf	Final Drainage Report for Coventry Estates Residential Subdivision	American Engineering Company	Southwest corner of 67th Avenue and Grovers Avenue	Electronic	PDF	03/19/09	02/10/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-137.pdf
40	DR-138.pdf	Drainage Report for Fireside Villas	AEC Consultants, Inc.	68th Drive and Bethany Home Road	Electronic	PDF	03/19/09	02/26/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-138.pdf
41	DR-139.pdf	Drainage Report for Federated Insurance	Erickson & meeks Engineering, LLC	SW corner of the intersection of 57th Avenue and Talavai Boulevard	Electronic	PDF	03/19/09	12/12/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-139.pdf
42	DR-140.pdf	Drainage Report for Country Club Estates At Arrowhead Ranch	Coe & Van Loo Consultants, Inc.	67th Avenue and Beardsley	Electronic	PDF	03/19/09	03/12/92	City of Glendale		From_COG_3.19.08\DrainageReports\DR-140.pdf
43	DR-141.pdf	Drainage Study Analysis Report	Project Engineering Consultants, LTD.	Maryland Avenue Overpass	Electronic	PDF	03/19/09	07/03/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-141.pdf
44	DR-142.pdf	Final Drainage Study Analysis Report Glendale/59th/Grand Avenue Intersection	Project Engineering Consultants, LTD.	Glendale Avenue and 59th Avenue/Grand Avenue Intersection	Electronic	PDF	03/19/09	06/20/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-142.pdf

45	DR-143.pdf	Draft Drainage Study Analysis Report 67th Avenue and Olive Anvenue Overpasses at Grand Avenue	Project Engineering Consultants, LTD.	67th Avenue and Olive Avenue Overpasses at Grand Aveune	Electronic	PDF	03/19/09	06/20/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-143.pdf
46	DR-144.pdf	Il Palazzo At Arrowhead Ranch Drainage Report	Rick Engineering Company	Northwest corner of Union hills Drive and 59th Avenue	Electronic	PDF	03/19/09	May 2004	City of Glendale		From_COG_3.19.08\DrainageReports\DR-144.pdf
47	DR-145.pdf	Master Drainage Study for Continental at Arrowhead Ranch	Clouse Engineering, Inc.	Bounded by SR 417 (Loop101) north of Union Hills Drive	Electronic	PDF	03/19/09	02/23/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-145.pdf
48	DR-146.pdf	Hydrology and Hydraulics Report for Arrowhead Ranch Parcels 3 & 4	Clouse Engineering, Inc.	Between Arrowhead Loop Rd and 59th Ave. north of Beardsley Road	Electronic	PDF	03/19/09	11/15/93	City of Glendale		From_COG_3.19.08\DrainageReports\DR-146.pdf
49	DR-147.pdf	Final Drainage Report for Arrowhead Heights	Wood, Patel & Associates, Inc.	Beardsley Road to the north and 67th Avenue to the east	Electronic	PDF	03/19/09	01/24/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-147.pdf
50	DR-148.pdf	Drainage Design Report for Tarrington Place	Hoskin Ryan Consultants	Bounded by Alice Ave, Butler Dr, 63rd Ave, and 65th Ave	Electronic	PDF	03/19/09	12/05/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-148.pdf
51	DR-149.pdf	Final Drainage Report for: Compass Bank	Landform	59th Avenue and Bell Road	Electronic	PDF	03/19/09	05/08/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-149.pdf
52	DR-150.pdf	Drainage Report for Union Hills Drive and Loop 101	Brooks Engineers & Surveyors, Inc.	North side of Union Hills drive and west of Highway 101	Electronic	PDF	03/19/09	May 2004	City of Glendale		From_COG_3.19.08\DrainageReports\DR-150.pdf
53	DR-151.pdf	Final Drainage Report for Morningstar Estates	Infinity Egineering Services, LTD.	Southwest corner of Glendale Ave and 71st Ave	Electronic	PDF	03/19/09	05/21/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-151.pdf
54	DR-152.pdf	Final Drainage Report for Dave Brown Parkside Residential Subdivision	American Engineering Company	Southwest corner of 83rd Ave and Maryland Ave	Electronic	PDF	03/19/09	03/05/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-152.pdf
55	DR-153.pdf	Hillcrest Ranch Phase I, Drainage Improvements	Wood, Patel & Associates, Inc.	Deer Valley Road and 67th Avenue	Electronic	PDF	03/19/09	12/07/91	City of Glendale		From_COG_3.19.08\DrainageReports\DR-153.pdf
56	DR-154.pdf	Grand Avenue at Northern Avenue Preliminary Drainage Report	Aztec Engineering	Grand Avenue - 67th Ave & Northern Ave	Electronic	PDF	03/19/09	February 2002	City of Glendale		From_COG_3.19.08\DrainageReports\DR-154.pdf
57	DR-155.pdf	Addendum to Rinal Drainge Report for Estates at Arrowhead Phase I	The Harrison Group, Inc.	Melinda Lane & Arrowhead Lake Drive	Electronic	PDF	03/19/09	January 1995	City of Glendale		From_COG_3.19.08\DrainageReports\DR-155.pdf
58	DR-156.pdf	Drainage Report for Cyprus Garden Condominiums	Desert Land Engineering, Inc.	Between 51st and 59th Avenue and Laurie Ln. and Royal Palm Rd.	Electronic	PDF	03/19/09	01/05/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-156.pdf
59	DR-157.pdf	Drainage Report for Thunderbird Masonry	AEC Consultants, Inc.	Missour Ave & 59th Ave	Electronic	PDF	03/19/09	03/30/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-157.pdf
60	DR-158.pdf	Preliminary Drainage Report for Trilogy at Provence	United Engineering Group	North of northeast corner of 91st ave and Glendale Road	Electronic	PDF	03/19/09	07/31/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-158.pdf
61	DR-159.pdf	Hydrology and Hydraulics Report for Chelsea Village	Clouse Engineering, Inc.	North of Union Hills Drive with 51st Ave on the east and Skunk Creek Wash on northwest	Electronic	PDF	03/19/09	07/30/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-159.pdf
62	DR-160.pdf	Creek Side Marketplace - Skunk Creek Hydraulic Analysis	Lowry & Associates	Northwest corner of Bell Road and 67th Ave	Electronic	PDF	03/19/09	May 1986	City of Glendale		From_COG_3.19.08\DrainageReports\DR-160.pdf
63	DR-161.pdf	Creekside Marketplace - Skunk Creek Design Report	NBS/Lowry	Northwest corner of Bell Road and 67th Ave	Electronic	PDF	03/19/09	11/07/86	City of Glendale		From_COG_3.19.08\DrainageReports\DR-160.pdf
64	DR-162.pdf	Final Drainage Report for Eagle Pass	David Evans and Associates, Inc.	Southeast corner of 75th Ave and Bethany Home Road	Electronic	PDF	03/19/09	April 1999	City of Glendale		From_COG_3.19.08\DrainageReports\DR-162.pdf
65	DR-163.pdf	Drainage Report for Manistee Ranch Parcel 1	Clouse Engineering, Inc.	Bordered by Northern Ave, Orangewood Ave, 51st Ave, and 55th Ave	Electronic	PDF	03/19/09	07/11/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-163.pdf
66	DR-164.pdf	Drainage Report for Unit 10 Country Meadows	Coe & Van Loo Consultants, Inc.	Between Northern Ave and Orangewood Ave west of 109th Ave	Electronic	PDF	03/19/09	01/11/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-164.pdf
67	DR-165.pdf	Final Drainage Study for Evergreen Devco, Inco	David Evans and Associates, Inc.	Southwest corner of 51st Ave and Northern Ave	Electronic	PDF	03/19/09	October, 1996	City of Glendale		From_COG_3.19.08\DrainageReports\DR-165.pdf
68	DR-166.pdf	Final drainage Report for Eaton Northern Avenue Industrial Park Phase 2	American Engineering Company	near 71st Ave and Northern Ave	Electronic	PDF	03/19/09	07/13/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-166.pdf
69	DR-167.pdf	Final Drainage Report for San Remo Apartments	RBF Consulting	south of the southeast corner of 59th Ave and Bethany Home Road	Electronic	PDF	03/19/09	August 2002	City of Glendale		From_COG_3.19.08\DrainageReports\DR-167.pdf
70	DR-168.pdf	Final Drainage Report for La Paloma	Stantec Consulting, Inc.	Bordered by Cactus Road, 51st Ave, and AZ Canal	Electronic	PDF	03/19/09	10/26/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-168.pdf
71	DR-169.pdf	Palm Terrace Drainage Report	Rick Engineering Company	Between 59th Ave and 55th Ave and Hayward Ave	Electronic	PDF	03/19/09	April 2002	City of Glendale		From_COG_3.19.08\DrainageReports\DR-169.pdf
72	DR-170.pdf	Final Drainage Report for "Paradise Views III"	Sage Engineering Corporation	Between Frier Dr., 73rd Ave, 71st Ave, and Orangewood Ave	Electronic	PDF	03/19/09	11/07/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-170.pdf
73	DR-171.pdf	Final Drainage Report for Evergreen Devco, Inc. 59th Ave and Peoria Ave Offsite (Walgreens)	David Evans and Associates, Inc.	59th Ave and Peoria Ave	Electronic	PDF	03/19/09	January 1997	City of Glendale		From_COG_3.19.08\DrainageReports\DR-171.pdf
74	DR-172.pdf	The Isle at Arrowhead Ranch Apartments Drainage Report	Rick Engineering Company	Southwest corner of Arrowhead Loop Road and 67th Ave	Electronic	PDF	03/19/09	1996?	City of Glendale		From_COG_3.19.08\DrainageReports\DR-172.pdf
75	DR-173.pdf	Final Drainage Report for Rancho Mirage Estates II	Huitt-Zollars, Inc.	southeast corner of 67th Ave and Greenway Ave	Electronic	PDF	03/19/09	January 1997	City of Glendale		From_COG_3.19.08\DrainageReports\DR-173.pdf
76	DR-174.pdf	Arrowhead Ranch Apartments Drainage Report	Rick Engineering Company	Southwest corner of Union Hills Dr. and 79th Ave	Electronic	PDF	03/19/09	12/22/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-174.pdf
77	DR-175.pdf	Drainage Report for Arrowhead Executive Center	Brooks, Hersey & Associates, Inc.	East side of 75th Ave north of Bell Road	Electronic	PDF	03/19/09	April 1998	City of Glendale		From_COG_3.19.08\DrainageReports\DR-175.pdf
78	DR-176.pdf	Drainage Report for "The Educational Park at the Highlands"	Atherton Engineering, Inc.	63rd Ave, south of The Highlands at Arrowhead Ranch IV	Electronic	PDF	03/19/09	07/29/98	City of Glendale		From_COG_3.19.08\DrainageReports\DR-176.pdf
79	DR-177.pdf	Drainage Report for Tierra Verde Parcel G	Coe & Van Loo Consultants, Inc.	Bordered by Deer Valley Road, 67th Ave, 57th Ave, and Agua Fria Freeway Channel	Electronic	PDF	03/19/09	12/21/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-177.pdf
80	DR-178.pdf	Final Drainage Report for Estates at Arrowhead Phase 1	The Harrison Group, Inc.	Melinda Lane & Arrowhead Lake Drive	Electronic	PDF	03/19/09	April, 1994	City of Glendale		From_COG_3.19.08\DrainageReports\DR-178.pdf
81	DR-179.pdf	Arrowhead Enclave Final Drainage Report	CMX Group Inc.	Northwest corner of 63rd Ave & Beardsley Road	Electronic	PDF	03/19/09	04/24/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-179.pdf
82	DR-180.pdf	Addendum to Final Drainage Report for Estates at Arrowhead Phase 1	The Harrison Group, Inc.	Melinda Lane & Arrowhead Lake Drive	Electronic	PDF	03/19/09	January, 1995	City of Glendale		From_COG_3.19.08\DrainageReports\DR-180.pdf
83	DR-181.pdf	Drainage Report for Tierra Verde Parcel D	Coe & Van Loo Consultants, Inc.	Bordered by Deer Valley Road, 67th Ave, 57th Ave, and Agua Fria Freeway Channel	Electronic	PDF	03/19/09	12/21/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-181.pdf
84	DR-182.pdf	Final Drainage Study for Evergreen Devco, Inc.	David Evans and Associates, Inc.	Southwest corner of 67th Ave and Hillcrest Boulevard	Electronic	PDF	03/19/09	September, 1997	City of Glendale		From_COG_3.19.08\DrainageReports\DR-182.pdf
85	DR-183.pdf	Drainage Report for Tierra Verde Parcel E	Coe & Van Loo Consultants, Inc.	Bordered by Deer Valley Road, 67th Ave, 57th Ave, and Agua Fria Freeway Channel	Electronic	PDF	03/19/09	12/21/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-183.pdf
86	DR-184.pdf	Final Drainage Report for Fulton Homes @ Tierra Verde	CMX Group Inc.	northeast corner of 71st Ave and Beardsley Road frontage road	Electronic	PDF	03/19/09	February, 1996	City of Glendale		From_COG_3.19.08\DrainageReports\DR-184.pdf
87	DR-185.pdf	Final Drainage Report for Glendale Northwest	Norman Engineering Group, Inc.	South of Union Hills Drive between Auga Fria Freeway and 83rd Ave	Electronic	PDF	03/19/09	10/29/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-185.pdf
88	DR-186.pdf	Storm Drainage Summary for the Arrowhead Ranch	Wilson L. Morris	Arrowhead Ranch Glendale, AZ	Electronic	PDF	03/19/09	06/30/91	City of Glendale		From_COG_3.19.08\DrainageReports\DR-186.pdf
89	DR-187.pdf	Arrowhead Ranch Development: Specific Area Plan, Storm Drainage Plan	Dibble and Associates	Arrowhead Ranch Glendale, AZ	Electronic	PDF	03/19/09	04/20/92	City of Glendale		From_COG_3.19.08\DrainageReports\DR-187.pdf
90	DR-188.pdf	Lake System Storm Drainage Master Plan for Arrowhead Ranch	URS Corporation	Arrowhead Ranch Sections 18 and 19	Electronic	PDF	03/19/09	04/25/86	City of Glendale		From_COG_3.19.08\DrainageReports\DR-188.pdf
91	DR-189.pdf	Drainage Report for Rovey Farm Estates Infrastructure	Coe & Van Loo Consultants, Inc.	Bordered by Northern Ave, 83rd Ave, 89th Avenue and Glendale Ave	Electronic	PDF	03/19/09	06/21/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-189.pdf
92	DR-190.pdf	Final Drainage Report for Villas Solana Apartments	RBF and Associates	Northeast corner of 83rd Ave and Ocotillo Rd	Electronic	PDF	03/19/09	04/01/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-190.pdf
93	DR-191.pdf	Hydrology and Hydraulics Report for Tanoan and Top of the Ranch Three	Clouse Engineering, Inc.	Deer Valley Road on the south and 67th Avenue on the west	Electronic	PDF	03/19/09	09/13/93	City of Glendale		From_COG_3.19.08\DrainageReports\DR-191.pdf
94	DR-192.pdf	The Fairways at Arrowhead Phase II Drainage Report	Rick Engineering Company	Arrowhead Clubhouse Drive and off of 73rd Avenue	Electronic	PDF	03/19/09	07/01/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-192.pdf

95	DR-193.pdf	Final Drainage Report of The Village on 59th Avenue - Unit II	Project Engineering Consultants, LTD.	The Village on 59th Avenue - Unit II	Electronic	PDF	03/19/09	09/13/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-193.pdf
96	DR-194.pdf	Final Drainage Report for Westgate Alexan and the Quarter Sites	David Evans and Associates, Inc.	located within Section 9, Township 2 North, Range 1 East of the Salt River and Gila River Base and Meridian.	Electronic	PDF	03/19/09	12/01/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-194.pdf
97	DR-195.pdf	Flood Control District of Maricopa County Flood Response Plan for Thunderbird Paseo Park	LTM Engineering, Inc.	Thunderbird Paseo Park, Glendale, AZ approx. 51st Avenue to 75th Avenue	Electronic	PDF	03/19/09	01/01/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-195.pdf
98	DR-196.pdf	Westgate Offsite Drainage Report for 91st Ave and Maryland Ave	Wood, Patel & Associates, Inc.	Bordered by Glendale Ave, Maryland Ave, Agua Fria Freeway and 91st Ave	Electronic	PDF	03/19/09	10/09/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-196.pdf
99	DR-197.pdf	Westgate Offsite Drainage Report for Glendale Avenue	Wood, Patel & Associates, Inc.	Bordered by Glendale Ave, Maryland Ave, Agua Fria Freeway and 91st Ave	Electronic	PDF	03/19/09	09/20/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-197.pdf
100	DR-198.pdf	Master Drainage Study for Tierra Verde	Clouse Engineering, Inc.	Bordered by Deer Valley Road, 67th Ave, 75th Ave and Agua Fria Freeway Drainage Channel	Electronic	PDF	03/19/09	11/10/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-198.pdf
101	DR-199.pdf	Revised Drainage Report for Touchtone Two	Clouse Engineering, Inc.	Southeast corner of 55th Ave and Grovers Ave	Electronic	PDF	03/19/09	12/02/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-199.pdf
102	DR-200.pdf	Final Drainage Report for Westpark Manor	Infinity Egineering Services, LTD.	Southwest corner of Olive and 67th Ave	Electronic	PDF	03/19/09	06/15/98	City of Glendale		From_COG_3.19.08\DrainageReports\DR-200.pdf
103	DR-201.pdf	Hydrology and Hydraulics Report for Chelsea Village	Clouse Engineering, Inc.	South of Union Hills between 51st Ave and Skunk Creek Wash	Electronic	PDF	03/19/09	07/30/94	City of Glendale		From_COG_3.19.08\DrainageReports\DR-201.pdf
104	DR-202.pdf	Thunderbird Samaritan Medical Center, Proposed Conditions and Drainage Calculations for Strom Drain System and Retention Basins Expansion Project	Kimley-Horn and Associates, Inc.	Southwest corner of 51st Ave and Thunderbird	Electronic	PDF	03/19/09	03/01/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-202.pdf
105	DR-203.pdf	Thunderbird Samaritan Medical Center Expansion Project, Parking Structure Improvements, Roof Drain Hydraulic Calculations and Retention Basin Calculations	Kimley-Horn and Associates, Inc.	Southwest corner of 51st Ave and Thunderbird	Electronic	PDF	03/19/09	12/21/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-203.pdf
106	DR-204.pdf	Drainage Report for Carmel Cove III	Clouse Engineering, Inc.	South of Union Hills and West of 51st Avenue	Electronic	PDF	03/19/09	09/19/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-204.pdf
107	DR-205.pdf	Initial Drainage Study	Z & H Engineering, Inc.	67th Ave between Olive and Northern	Electronic	PDF	03/19/09	01/12/88	City of Glendale		From_COG_3.19.08\DrainageReports\DR-205.pdf
108	DR-206.pdf	Final Drainage Report for Orangewood Estates	Infinity Egineering Services, LTD.	Southwest corner of 75th Avenue and Orangewood Avenue in Glendale	Electronic	PDF	03/19/09	03/12/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-206.pdf
109	DR-207.pdf	Preliminary Hydraulic Study	Kaminski-Hubbard Engineering Inc.	67th Avenue Bridge at Skunk Creek	Electronic	PDF	03/19/09	06/01/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-207.pdf
110	DR-208.pdf	Final Drainage Report 67th Avenue Improvement Phase III	John Carollo Engineers	Peoria Avenue and Cactus Rd	Electronic	PDF	03/19/09	03/13/89	City of Glendale		From_COG_3.19.08\DrainageReports\DR-208.pdf
111	DR-209.pdf	Final Drainage Report (Stage V Design)	DMJM+Harris	Aqua Fria Freeway (101L) Bethany Home Road	Electronic	PDF	03/19/09	03/09/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-209.pdf
112	DR-210.pdf	The Park at Arrowhead Towne Center Drainage Report	Rick Engineering Company	17600 N. 79th Avenue, Glendale, AZ	Electronic	PDF	03/19/09	10/17/97	City of Glendale		From_COG_3.19.08\DrainageReports\DR-210.pdf
113	DR-211.pdf	Infrastructure Drainage Study	WRG Design Inc.	157 acres located immediately west of 91st Avenue and immediately north of Glendale	Electronic	PDF	03/19/09	01/06/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-211.pdf
114	DR-212.pdf	Drainage Report	WRG Design Inc.	east of the Loop 101 Freeway at the northeast corner of 95th and Glendale Avenues	Electronic	PDF	03/19/09	02/28/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-212.pdf
115	DR-213.pdf	Final Drainage Report for Trilogy at Provence	United Engineering Group	660ft north of the northeast corner of 91st Avenue and Glendale Rd. in Glendale	Electronic	PDF	03/19/09	03/09/05	City of Glendale		From_COG_3.19.08\DrainageReports\DR-213.pdf
116	DR-214.pdf	59th Avenue and Cactus Drainage Report	Z & H Engineering, Inc.	59th Avenue and Cactus Road	Electronic	PDF	03/19/09	02/06/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-214.pdf
117	DR-215.pdf	Drainage Report for Office Warehouse - Northern Industrial Center	Morea-Hall Engineering, Inc.	located on the north side of Frier Drive between 71st Ave and 72nd Drive	Electronic	PDF	03/19/09	02/09/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-215.pdf
118	DR-216.pdf	Final Drainage Report NW Corner of Bell Rd. and 55th Avenue	BCA Engineering Inc.	northwest corner of Bell Road and 55th Avenue	Electronic	PDF	03/19/09	02/11/04	City of Glendale		From_COG_3.19.08\DrainageReports\DR-216.pdf
119	DR-217.pdf	Drainage Report for Fulton Homes At Arrowhead Ranch Phase I	American Engineering Company	NE corner of the intersection of Beardsley Rd and 59th Avenue Glendale	Electronic	PDF	03/19/09	06/29/92	City of Glendale		From_COG_3.19.08\DrainageReports\DR-217.pdf
120	DR-218.pdf	Water Surface Restoration Plan	Pacific Advanced Civil Engineering	4583E Sierra Verde Lake #7	Electronic	PDF	03/19/09	06/19/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-218.pdf
121	DR-219.pdf	Master Drainage Report	Olsson Associates	NE corner of 83rd Avenue and Bethany Home Road	Electronic	PDF	03/19/09	11/12/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-219.pdf
122	DR-220.pdf	Storm Drain Report	Kimley-Horn and Associates, Inc.	59th Avenue Storm Sewer Olive Avenue to Brown Street	Electronic	PDF	03/19/09	02/25/08	City of Glendale		From_COG_3.19.08\DrainageReports\DR-220.pdf
123	DR-221.pdf	Final Drainage Report	Kimley-Horn and Associates, Inc.	Arrowhead Commerce Park Glendale	Electronic	PDF	03/19/09	10/24/01	City of Glendale		From_COG_3.19.08\DrainageReports\DR-221.pdf
124	DR-222.pdf	Final Drainage Report for San Prado Apartments	Wood, Patel & Associates, Inc.	SW corner of 59th Avenue and Utopia Rd	Electronic	PDF	03/19/09	11/18/02	City of Glendale		From_COG_3.19.08\DrainageReports\DR-222.pdf
125	DR-223.pdf	Final Drainage Report for Villas Solana Apartments	RBF & Associates	NE corner of the intersection of 83rd Ave & Ocotillo Rd	Electronic	PDF	03/19/09	04/20/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-223.pdf
126	DR-224.pdf	Final Drainage Report for Topaz	Clouse Engineering, Inc.	Orangewood Avenue just west of 79th Avenue	Electronic	PDF	03/19/09	12/22/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-224.pdf
127	DR-225.pdf	Final Drainage Report for Compass Bank	Landform	67th and the 101 Freeway - The Village at Arrowhead	Electronic	PDF	03/19/09	05/07/03	City of Glendale		From_COG_3.19.08\DrainageReports\DR-225.pdf
128	DR-226.pdf	Final Drainage Report for Eagle Pass	David Evans and Associates, Inc.	SE corner of 75th Avenue and Bethany Home Road	Electronic	PDF	03/19/09	02/05/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-226.pdf
129	DR-227.pdf	Final Drainage Report for Park Paseo	Sage Engineering Corporation	south of Bell Road along the alignment of 73rd Avenue	Electronic	PDF	03/19/09	07/18/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-227.pdf
130	DR-228.pdf	Final Drainage Report for The Village on 59th Avenue - Unit II	Project Engineering Consultants, LTD.	Between 59th and 57th Avenue approximately 2500 feet south of Olive Avenue	Electronic	PDF	03/19/09	09/13/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-228.pdf
131	DR-229.pdf	Drainage Report Camino Estates	Core Group Consultants	Northwest corner of 71st Avenue and Claremont Street	Electronic	PDF	03/19/09	12/18/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-229.pdf
132	DR-230.pdf	Final Drainage Report for Carmel Cove Units II & IV	Landmark Engineering, Inc.	Union Hills Drive and 59th Avenue	Electronic	PDF	03/19/09	12/28/99	City of Glendale		From_COG_3.19.08\DrainageReports\DR-230.pdf
133	DR-231.pdf	Final Drainage Report for Manistee Ranch Parcel III	American Engineering Company	Hayward Avenue to the north, Proposed Manistee Ranch Parcel 2 Retention Basin to the west, 51st Avenue to the east, and Orangewood Avenue to the south	Electronic	PDF		09/01/98	City of Glendale		From_COG_3.19.08\DrainageReports\DR-231.pdf
134	DR-232.pdf	Final Drainage Report for Manistee Ranch Parcel II	American Engineering Company	55" Avenue to the west, Hayward Avenue to the north, Manistee Ranch Parcel 3 to the east, and Sands Park to the south	Electronic	PDF		11/12/98	City of Glendale		From_COG_3.19.08\DrainageReports\DR-232.pdf
135	DR-233.pdf	Final Drainage Report for Cabrillo Point	M2 Group, INC	south of Skunk Creek and Grandview Road, west of 73rd Avenue, and northeast of the Thunderbird Paseo	Electronic	PDF		06/01/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-233.pdf
136	DR-234.pdf	Final Drainage Report for Cornerstone at Camelback	Hunter Engineering, Inc.	NEC, Camelback & 99th Ave	Electronic	PDF		06/01/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-234.pdf
137	DR-235.pdf	Drainage Report for Vineyard Christian Fellowship	EEC Engineering & Environmental Consultants Inc.	NEC, Peoria Ave & 63rd Ave	Electronic	PDF		08/01/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-235.pdf
138	DR-236.pdf	Final Drainage Report for The Lodge at Arrowhead Town Center	Wood, Patel & Associates, Inc.	SEC, Bell Rd & Skunk Creek	Electronic	PDF		07/11/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-234.pdf
139	DR-237.pdf	Drainage Report for Proposed Arrowhead Medical, Denatl Plaze, Ph I & II	A-N West, Inc.	~700 feet south of Union Hills on the East side of 79th Ave	Electronic	PDF		11/16/98	City of Glendale		From_COG_3.19.08\DrainageReports\DR-237.pdf

140	DR-238.pdf	Final Drainage Report for Desert Glen Estates	Landmark Engineering, Inc.	West of 75th Ave on the North side of Glendale Rd	Electronic	PDF		08/04/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-238.pdf
141	DR-239.pdf	Geotechnical Evaluation for Eagle Social Hall	Western Technologies, Inc.	67th Ave North of Orangewood	Electronic	PDF		06/07/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-239.pdf
142	DR-240.pdf	Final Drainage Report of The Village on 59th Avenue - Unit II	Project Engineering Consultants, LTD.	between 59*** Avenue and 57*** Avenue, approximately 2500 feet south of Olive Avenue	Electronic	PDF		09/13/00	City of Glendale		From_COG_3.19.08\DrainageReports\DR-240.pdf
143	DR-241.pdf	Drainage Report, Glendale Park at Tarrington Place	RBF Consulting	south of Butler Drive and east of 63rd Avenue	Electronic	PDF		01/13/06	City of Glendale		From_COG_3.19.08\DrainageReports\DR-241.pdf
144	DR-242.pdf	Special Provisions for Cactus Road Storm Drain	SFC Engineering Company	67th Ave to the Agua Fria	Electronic	PDF		03/01/93	City of Glendale		From_COG_3.19.08\DrainageReports\DR-242.pdf
145	DR-243.pdf	Design Data Report for the Cactus Road Storm Drain	SFC Engineering Company	67th Ave to the Agua Fria	Electronic	PDF		11/01/92	City of Glendale		From_COG_3.19.08\DrainageReports\DR-243.pdf
146	DR-244.pdf	Drainage Report for Tierra Verde Parcel B	Coe & Van Loo Consultants, Inc.	bordered by Deer Valley Road on the north, 67th Avenue on the east, and 75th Avenue on	Electronic	PDF		12/20/95	City of Glendale		From_COG_3.19.08\DrainageReports\DR-244.pdf
147	DR-245.pdf	Drainage Report for Casa Linda Subdivision	Coe & Van Loo Consultants, Inc.	Glendale Avenue on the north, 75th Avenue on the	Electronic	PDF		09/27/96	City of Glendale		From_COG_3.19.08\DrainageReports\DR-245.pdf
148	DR-246.pdf	Drainage Report for the Highlands at Arrowhead Ranch	Coe & Van Loo Consultants, Inc.	SEC, of 67th Avenue and Beardsley Road	Electronic	PDF		11/28/95	City of Glendale		
149	DR-247.pdf	Final Drainage Study, Boston Market	David Evans and Associates, Inc.	SEC, 59th Ave & Peoria	Electronic	PDF		03/01/97	City of Glendale		
150	DR-248.pdf	Drainage Report for Valencia II	Clouse Engineering, Inc.	~0.25 miles south of Rose Garden Lane, with 71st Avenue bordering on the east	Electronic	PDF		06/26/96	City of Glendale		
151	DR-249.pdf	Drainage Report for Desert Mirage Golf Course	High Desert Engineering	South of Glendale Avenue, and of 83rd Ave	Electronic	PDF		10/01/97	City of Glendale		
152	DR-250.pdf	Drainage Report for Manistee Ranch Parcel 4	Clouse Engineering, Inc.	Northern Avenue on the north, Orangewood Avenue on the south, 51st Avenue on the east, and 55th Avenue on the west	Electronic	PDF		07/11/97	City of Glendale		
153	DR-251.pdf	Final Drainage Report for Coventry Estates Residential Subdivision	American Engineering Company	located at the Southwest comer of 67th Avenue and Grovers Avenue	Electronic	PDF		02/10/95	City of Glendale		
154	DR-252.pdf	Drainage Report for Highland Point	Clouse Engineering, Inc.	Glendale with Utopia Road bordering the south and 63rd Avenue bordering on the west	Electronic	PDF		01/08/97	City of Glendale		
155	DR-253.pdf	Final Drainage Report, Alexan	David Evans and Associates, Inc.	93rd Avenue to the east, Coyote Boulevard to the north, Maryland Avenue to the south and an existing parking to the west	Electronic	PDF		09/01/05	City of Glendale		
156	DR-254.pdf	Final Drainage Report for Randolph Ranch	American Engineering Company	NEC, 59th Ave & Olive	Electronic	PDF		08/01/97	City of Glendale		
157	DR-255.pdf	Drainage Report Arrowhead Loop Road	Greiner, Inc.	continuation of the Arrowhead Loop Road linking it from its westerly terminus at the cul-de-sac to the other end at 67th Avenue	Electronic	PDF		05/01/96	City of Glendale		
158	DR-256.pdf	Drainage Report for Laguna Apts	Rick Engineering Company	northeast corner of 75th Avenue and the Agua Fria Freeway	Electronic	PDF		09/11/95	City of Glendale		
159	DR-257.pdf	Drainage Report for Montebello Estates	Clouse Engineering, Inc.	NEC, 79th Avenue and Missouri Avenue	Electronic	PDF		07/29/97	City of Glendale		
160	DR-258.pdf	Hydrology Report for Arrowhead Apts, Phase II	DNA, Inc.	SWC, 79th Ave and St. Johns Ro	Electronic	PDF		02/01/98	City of Glendale		
161	DR-259.pdf	Drainage Report for Proposed Arrowhead Medical, Denatl Plaza	A-N West, Inc.	~700 feet south of Union Hills Road on the east side of 79th Avenue	Electronic	PDF		05/11/98	City of Glendale		
162	DR-260.pdf	Drainage Report for Tierra Verde, Parcel Q	Coe & Van Loo Consultants, Inc.	d by Deer Valley Road on the north, 67th Avenue on the east, and 75th Avenue on the west	Electronic	PDF		02/22/96	City of Glendale		
163	DR-261.pdf	Bell Road Project Drainage Study, Exec Sum	Greiner, Inc.		Electronic	PDF		10/01/87	City of Glendale		
164	DR-262.pdf	Hydrology and Hydraulics Report for Flora Cove	Clouse Engineering, Inc.	NEC of 71st Ave and Deer Valley in Glendlale	Electronic	PDF		03/01/94	City of Glendale		
165	DR-263.pdf	Drainage Report for Fulton Homes At Arrowhead Ranch Phase II	American Engineering Company	NEC of Beardsley and 59th Ave	Electronic	PDF		10/25/92	City of Glendale		
166	DR-264.pdf	Drainage Report for Checker Auto	Brooks, Hersey & Associates, Inc.	59th & Thunderbird	Electronic	PDF		03/01/99	City of Glendale		
167	DR-265.pdf	Final Drainage Report for Carmel Cove Unit II	Landmark Engineering, Inc.	Utopia Rd to the North, 55th Ave Drainage channel to the West and Skunk Creek to the Southeast	Electronic	PDF		06/27/97	City of Glendale		
168	DR-266.pdf	Hydrology and Hydraulics Report for Camelot Views at Arrowhead Ranch	Clouse Engineering, Inc.	59th Avenue on the East, Arrowhead Loop on the West, existing golf course on the North and existing lakes on the South.	Electronic	PDF		01/26/93	City of Glendale		
169	DR-267.pdf	Drainage Report for Talavi Flex III	Erickson & meeks Engineering, LLC	NEC of the intersection of 57th ave and Beverly Lane	Electronic	PDF		06/28/05	City of Glendale		
170	DR-268.pdf	Concept Drainage Analysis for the Camelback Traffic Interchange	Tudor Engineering Company	Grand Ave from New River to 7th Ave and Van Buren	Electronic	PDF		08/01/89	City of Glendale		
171	DR-269.pdf	Bell Road Project Drainage Study, Selected Floodwater/Stormwater Management Plan	Greiner Engineering Sciences, Inc.		Electronic	PDF		05/01/87	City of Glendale		
172	DR-270.pdf	Appendices to Drainage Report for Bell Rd Section 6	Donahue & Associates, Inc.		Electronic	PDF		05/13/91	City of Glendale		
173	DR-271.pdf	Appendix H, Arrowhead Festival	Val-Tec, Inc.	Benchmark for 75th Ave and Bell Rd	Electronic	PDF		05/26/95	City of Glendale		
174	DR-272.pdf	Master Drainage Report for CBD101 & Organic 101	CMX, LLC	SEC of SR 101 and Bethany Home Rd	Electronic	PDF		07/01/07	City of Glendale		
175	DR-273.pdf	Final Drainage Report for Glendale Condominium Site I	DEI Professional Services	SWC 57th Ave and Palmaire	Electronic	PDF		02/08/07	City of Glendale		
176	DR-274.pdf	Final Drainage Report for Glendlale Condominium Site II	DEI Professional Services	NEC 58th Ave and Palmaire	Electronic	PDF		02/06/07	City of Glendale		
177	DR-275.pdf	Final Drainage Report for Comfort Suites Hotel	PK Kland Consulting Civil Engineers, LLC	99th Ave and Camelback	Electronic	PDF		02/02/07	City of Glendale		
178	DR-276.pdf	Drainage Report for Westgate Hampton Inn and Suites	Erickson & meeks Engineering, LLC	NE of the intersection of 95th Ave and Maryland	Electronic	PDF		11/27/06	City of Glendale		
179	DR-277.pdf	Drainage Report for Cooks Commercial Glazing	RCC Design Group, LLC	Augusta Ave and 71st Ave	Electronic	PDF		05/15/07	City of Glendale		
180	DR-278.pdf	Final Drainage Report for Bethany Rose North	D & M Engineering,	S and adjacent to Claremont St between 71st Dr and 71st Ave	Electronic	PDF		05/01/06	City of Glendale		
181	DR-279.pdf	Drainage Report for Garduno's	RCC Design Group, LLC	glendale Ave and 95th Ave	Electronic	PDF		02/14/07	City of Glendale		
182	DR-280.pdf	Drainage Report for Tekland Warehouse	Oringineering, LLC	N side of Myrtle just W of the intersection of Myrtle and Grand	Electronic	PDF		10/23/06	City of Glendale		
183	DR-281.pdf	Copper Cove Phase I	Rick Engineering Company	91st Ave and Missouri	Electronic	PDF		04/12/07	City of Glendale		
184	DR-282.pdf	Copper Cove Phase I	Rick Engineering Company	91st Ave and Missouri	Electronic	PDF		07/24/07	City of Glendale		
185	DR-283.pdf	Copper Cove Phase II	Rick Engineering Company	91st Ave and Camelback	Electronic	PDF		02/06/08	City of Glendale		
186	DR-284.pdf	Drainage Report for Brookside Office condos	JMI and Associates	N Private residences, S Sunnyside Drive, E Arizona Canel, W 51st Ave	Electronic	PDF		05/02/07	City of Glendale		
187	DR-285.pdf	Master Drainage Report for the Districts of Zanjero	CMX, LLC	NWC of 91st Ave and Glendale	Electronic	PDF		06/01/07	City of Glendale		
188	DR-286.pdf	Final Drainage Report for 91 Glendale	DEI Professional Services	NEC of 91st Ave and Glendale	Electronic	PDF		09/13/06	City of Glendale		
189	DR-287.pdf	Final Drainage Report for Zanjero Falls Professional Villas	Wood, Patel & Associates, Inc.	NWC of 91st Ave and Zanjero Blvd	Electronic	PDF		09/26/07	City of Glendale		
190	DR-288.pdf	Addendum #3 to Westgate Final Drainage Report	David Evans and Associates, Inc.		Electronic	PDF		03/05/07	City of Glendale		

191	DR-289.pdf	Westgate Phase II, Addendum #2 to Final Drainage Report	David Evans and Associates, Inc.		Electronic	PDF		01/21/08	City of Glendale			
192	DR-290.pdf	Drainage Report for Cholla Cove	AEC Consultants, Inc.	Sunnyside Drive and 59th Avenue	Electronic	PDF		10/06/04	City of Glendale			
193	DR-291.pdf	Drainage Report of Il Pallazzo at Arrowhead Ranch	Rick Engineering Company	Union Hills to the South, 59th Ave to the East, and Skunk Creek alignment to the North and West	Electronic	PDF		Jul-04	City of Glendale			
194	DR-292.pdf	Drainage Report for Palm Terrace	Rick Engineering Company	South side of Hayward Ave between 55th and 59th Ave	Electronic	PDF		01/01/02	City of Glendale			
195	DR-293.pdf	Drainage Report Supplement for Bell Road Section 6	Val-Tec, Inc.		Electronic	PDF		08/17/92	City of Glendale			
196	DR-294.pdf	Infrastructure Drainage Study, Zanjero	WRG Design Inc.	W of 91st Ave and N of Glendale	Electronic	PDF		01/06/06	City of Glendale			
197	DR-295.pdf	Infrastructure Drainage Study, Zanjero	WRG Design Inc.	W of 91st Ave and N of Glendale	Electronic	PDF		04/28/05	City of Glendale			
198	DR-296.pdf	Drainage Report for Cabela's	WRG Design Inc.	NEC of 91st Ave and Glendale	Electronic	PDF		02/28/06	City of Glendale			
199	DR-297.pdf	Final Drainage Report for Orangewood Estates	Infinity Egineering Services, LTD.	SWC 71st Ave and Orangewood	Electronic	PDF		03/12/02	City of Glendale			
200	DR-298.pdf	Final Drainage Report Glendale NW Retail Site, Phase I Wal-Mart and Sam's Club	Kimley-Horn and Associates, Inc.	SEC of 83rd Ave and Unio Hills	Electronic	PDF		02/01/01	City of Glendale			
201	DR-299.pdf	Drainage Report Desert Eagle Apartments	Rick Engineering Company	SEC Glendale Ave and 71st Ave	Electronic	PDF		07/15/04	City of Glendale			
202	DR-300.pdf	Final Drainage Report Union Hills Drive Street Improvements and bridge widening Project	HDR Engineering, Inc.	SR 101 on the East 84th Ave on the West	Electronic	PDF		06/01/03	City of Glendale			
203	DR-301.pdf	Drainage Report for Arrowhead Ranch Parcel I	CMX, LLC	67th Ave and Beardsley	Electronic	PDF		06/01/95	City of Glendale			
204	DR-302.pdf	Arrowhead Ranch Parcel I, Drainage Report Supplement No. 1	CMX, LLC		Electronic	PDF		05/10/96	City of Glendale			
205	DR-303.pdf	Final Drainage Report for Trio Precision	Morea-Hall Engineering, Inc.	NEC 108th Ave and Northview Ave	Electronic	PDF		8/19/2004	City of Glendale			
206	DR-304.pdf	Final Drainage Report for Mission Groves 4 & 5	Sage Engineering Corporation	NEC 59th Ave and Cactus Rd	Electronic	PDF		12/12/95	City of Glendale			
207	DR-305.pdf	Revised Drainage Report for Office Warehouse Parcels 4-6 West Frier Drive, Northern Industrial Center	Morea-Hall Engineering, Inc.	N side of Frier Drive between 71st Ave and 72nd Ave	Electronic	PDF		07/15/04	City of Glendale			
208	DR-306.pdf	Final Drainage Report for Northern Gateway Commerce Park	PK Kland Consulting Civil Engineers, LLC	SWC Northern and 71st	Electronic	PDF		08/21/06	City of Glendale			
209	DR-307.pdf	Final Drainage Report for Westglen Villas	PK Kland Consulting Civil Engineers, LLC	Glendale Ave to the South and Myrtle to the North Paradise Villa Subdivision to the East	Electronic	PDF		02/06/06	City of Glendale			
210	DR-308.pdf	Drainage Report for Marshall Ranch	Sage Engineering Corporation	NEC 59th Ave and Cactus Rd	Electronic	PDF		02/15/89	City of Glendale			
211	DR-309.pdf	Final Drainage Report for 67th Ave improvements Northern Ave to Olive Ave	Stanley Consultants	67th Ave from Northern to Olive	Electronic	PDF		08/01/89	City of Glendale			
212	DR-310.pdf	Final Drainage Master Study for Manistee Ranch	David Evans and Associates, Inc.	SWC Northern and 51st Ave	Electronic	PDF		01/01/96	City of Glendale			
213	DR-311.pdf	Maryland Lakes Relief Storm Drain	Entellus	SWC of 47th Ave and Maryland	Electronic	PDF		04/01/97	City of Glendale			
214	DR-312.pdf	Drainage Report for Thunderbird Masonry	AEC Consultants, Inc.	Missour Ave & 59th Ave	Electronic	PDF		03/30/04	City of Glendale			
215	DR-313.pdf	Drainage Report for Marbrisa Ranch	Coe & Van Loo Consultants, Inc.	E of 59th Ave and S of Peoria Ave	Electronic	PDF		06/07/93	City of Glendale			
216	DR-314.pdf	Channel Rehabilitation Study, Lorimor Property	NBS/Lowry		Electronic	PDF		11/01/86	City of Glendale			
217	DR-315.pdf	Drainage Report for Proposed Challenge Charter School	A-N West, Inc.	59th Ave on the West, Greenbriar Dr on the North and 57th Ave on the East	Electronic	PDF		06/25/99	City of Glendale			
218	DR-316.pdf	Final Drainage Report for 67th Ave improvements Phase III	John Carollo Engineers	Peoria Avenue to Cactus Rd	Electronic	PDF		03/01/89	City of Glendale			
219	DR-317.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure	Clouse Engineering, Inc.	67th Ave and Deer Valley	Electronic	PDF		12/06/91	City of Glendale			
220	DR-318.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Phase II	Clouse Engineering, Inc.	75th Ave and Deer Valley	Electronic	PDF		09/28/92	City of Glendale			
221	DR-319.pdf	Hillcrest Ranch Phase II, Drainage Improvements	Wood, Patel & Associates, Inc.	Deer Valley and 67th Ave	Electronic	PDF		09/23/92	City of Glendale			
222	DR-320.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel B	Clouse Engineering, Inc.		Electronic	PDF		12/12/91	City of Glendale			
223	DR-321.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel D	Coe & Van Loo Consultants, Inc.		Electronic	PDF		09/08/92	City of Glendale			
224	DR-322.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel E	Clouse Engineering, Inc.		Electronic	PDF		09/11/92	City of Glendale			
225	DR-323.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel H	Clouse Engineering, Inc.		Electronic	PDF		10/06/93	City of Glendale			
226	DR-324.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel I	Clouse Engineering, Inc.		Electronic	PDF		08/10/92	City of Glendale			
227	DR-325.pdf	Hydrology and Hydraulics Report for Hillcrest Ranch Infrastructure Parcel L	Clouse Engineering, Inc.		Electronic	PDF		01/03/94	City of Glendale			
228	DR-326.pdf	Drainage Report for Olive Villas	Clouse Engineering, Inc.	45th Ave on the West, 43rd Ave on the East, Alice Ave on the South and Commercial Dev on the North	Electronic	PDF		03/03/95	City of Glendale			
229	DR-327.pdf	Drainage Study 83rd Ave and Union Hills Improvements	Kimley-Horn and Associates, Inc.	83rd between Union Hills and SR 101	Electronic	PDF		11/01/00	City of Glendale			
230	DR-328.pdf	Preliminary Storm Drain Design	Stanley Consultants	Bell Rd-67th Ave to Union Hills	Electronic	PDF		02/01/90	City of Glendale			
231	DR-329.pdf	Final Drainage Report for Bethany Place	David Evans and Associates, Inc.	SEC 75th Ave and Bethany Home	Electronic	PDF		02/01/99	City of Glendale			
232	DR-330.pdf	Drainage Report for Arrowhead Hospital Expansion	Evans, Khun and Associates, Inc.	NEC 67th and Union Hills	Electronic	PDF		06/08/04	City of Glendale			
233	DR-331.pdf	Drainage Study for Archstone-Smith Zanjero Apartments	Wood, Patel & Associates, Inc.	North of Glendale and East of 95th	Electronic	PDF		06/10/05	City of Glendale			
234	DR-332.pdf	Final Drainage Report for Glendale Corporate Center	Hunter Engineering, Inc.	North of Camelback on the East side of 99th Ave	Electronic	PDF		11/01/06	City of Glendale			
235	DR-333.pdf	Drainage Report for Vineyard Christian Fellowship, Phase II	EEC Enginerring & Environmental Consultants Inc.	NEC of Peoria and 63rd Ave	Electronic	PDF		06/01/07	City of Glendale			
236	DR-334.pdf	Final Drainage Report for the Reserve at Eagle Heights	David Evans and Associates, Inc.		Electronic	PDF		07/19/06	City of Glendale			
237	DR-335.pdf	Infrastructure Drainage Study, Zanjero	WRG Design Inc.		Electronic	PDF		04/28/05	City of Glendale			
238	DR-336.pdf	Final Drainage Report for Zanjero Falls Phase I	Wood, Patel & Associates, Inc.		Electronic	PDF		10/12/06	City of Glendale			
239	DR-337.pdf	Final Drainage Study Boardwalk Place	WRG Design Inc.		Electronic	PDF		06/15/05	City of Glendale			
240	DR-338.pdf	Drainage Report for Glendale Park at Tarrington Place	RBF Consulting		Electronic	PDF		09/09/05	City of Glendale			
241	DR-339.pdf	Final Drainage Report for Cornerstone at Camelback	Hunter Engineering, Inc.	NEC Camelback Rd & 99th Avenue	Electronic	PDF		06/01/06	City of Glendale			
242	DR-340.pdf	Drainage Report for Casa De Ensueno	Clouse Engineering, Inc.		Electronic	PDF		08/18/03	City of Glendale			
243	DR-341.pdf	Final Drainage Report for San martin Apartments	RBF Consulting		Electronic	PDF		04/01/02	City of Glendale			
244	DR-342.pdf	Final Drainage Report for Grace Lutheran Church	KPFF Consulting Engineers		Electronic	PDF		03/10/04	City of Glendale			
245	DR-343.pdf	Final Drainage Report for NW Corner of Bell Rd & 55th Ave	BCA Engineering Inc.		Electronic	PDF		02/11/04	City of Glendale			
246	DR-344.pdf	Final Drainage Study for Beacon Heights	Steele Engineering, LLC	53rd Ave, South of Peoria Ave	Electronic	PDF		05/02/05	City of Glendale			
247	DR-345.pdf	Final Drainage Report for Trilogy at Provence	United Engineering Group		Electronic	PDF		03/09/05	City of Glendale			
248	DR-346.pdf	Final Drainage Study for Tessera	WRG Design Inc.		Electronic	PDF		03/01/06	City of Glendale			
249	DR-347.pdf	Drainage Report for Walgreens	CMX Group Inc.	9009 N 67th Ave	Electronic	PDF		08/01/00	City of Glendale			
250	DR-348.pdf	Final Hydrologic/Hydraulic Calculations for the 67th Ave and Olive Ave Diamond Shamrock Sterling Series 2000 Convenience Store	Cella Barr Associates		Electronic	PDF		06/10/96	City of Glendale			
251	DR-349.pdf	Final Drainage Report for Morningstar Estates	Infinity Egineering Services, LTD.		Electronic	PDF		02/02/04	City of Glendale			
252	DR-350.pdf	Northern/Orangewood Storm drain project subphases B & C East Basin Design Concept	Wood, Patel & Associates, Inc.		Electronic	PDF		05/05/98	City of Glendale			

253	DR-351.pdf	Drainage Report for Unit 10 Country Meadows	Coe & Van Loo Consultants, Inc.		Electronic	PDF		08/17/95	City of Glendale			
254	DR-352.pdf	Preliminary Drainage Report for Bethany Home Road, 101L to 91st Ave	DMJM+Harris		Electronic	PDF		05/01/05	City of Glendale			
255	DR-353.pdf	Thunderbird Samaritan Medical Center Existing Condistions Drainage Report (1999)	Kimley-Horn and Associates, Inc.		Electronic	PDF		05/01/99	City of Glendale			
256	DR-354.pdf	Final Drainage Report for Fairview Crossing	Infinity Egineering Services, LTD.		Electronic	PDF		07/01/97	City of Glendale			
257	DR-355.pdf	Final Drainage Study for Claire Bridge ALS Alzheimer Care Facility	Teri S. Mintz, P.E.	SWC 67th Ave & Hillcrest Boulevard	Electronic	PDF		10/01/97	City of Glendale			
258	DR-356.pdf	Final Drainage Report for Carmel Cove Subdivision	American Engineering Company		Electronic	PDF		01/01/96	City of Glendale			
259	DR-357.pdf	Final Drainage Report for Osco Store 19-2141	Huitt-Zollars, Inc.		Electronic	PDF		04/01/98	City of Glendale			
260	DR-358.pdf	Drainage Report for Arrowhead Ranch Parcel I	CMX Group, Inc.		Electronic	PDF		06/01/95	City of Glendale			
261	DR-359.pdf	Drainage Report for Tierra Verde Parcel R	Coe & Van Loo Consultants, Inc.		Electronic	PDF		03/28/96	City of Glendale			
262	DR-360.pdf	Hydrology and Hydraulics Report for Coppercrest	Clouse Engineering, Inc.		Electronic	PDF		10/11/94	City of Glendale			
263	DR-361.pdf	Drainage Report for Thunderbird Ranch	Landmark Consultants, Inc.		Electronic	PDF		12/01/96	City of Glendale			
264	DR-362.pdf	Final Drainage Report for CCOJ-Youth & Recreation Center	David Evans and Associates, Inc.		Electronic	PDF		02/01/06	City of Glendale			
265	DR-363.pdf	Hydrology Report for Arrowhead Apts, Phase I	D.N.A. Inc.		Electronic	PDF		08/01/96	City of Glendale			
266	DR-364.pdf	Drainage Report for Tierra Verde Parcel O	Coe & Van Loo Consultants, Inc.	Deer Valley North, 67th Ave East, 75th Ave West	Electronic	PDF		02/15/96	City of Glendale			
267	DR-365.pdf	Drainage Report for Tierra Verde Parcel C	Clouse Engineering, Inc.	71st Ave West, Parcel A North, Parcel D East, lake #5 south	Electronic	PDF		12/21/95	City of Glendale			
268	DR-366.pdf	Drainage Report for Valencia III	Clouse Engineering, Inc.	71st Ave East, Aqua Fria South, Greenbelt/detention on the north and drainage channel on the west	Electronic	PDF		06/26/96	City of Glendale			
269	DR-367.pdf	Drainage Report for Sienna II	Clouse Engineering, Inc.	SEC of 75th Ave and Rose Garden Lane	Electronic	PDF		06/26/96	City of Glendale			
270	DR-368.pdf	Drainage Report for Tierra Verde Parcel N	Coe & Van Loo Consultants, Inc.	Deer Valley North, 67th Ave East, 75th Ave West	Electronic	PDF		03/28/96	City of Glendale			
271	DR-369.pdf	Drainage Report for Sierra Verde Phase II South Half	Clouse Engineering, Inc.	Rose Garden Lane north, 71st Ave east, 75th Ave west and Agua Fria channel south	Electronic	PDF		06/25/96	City of Glendale			
272	DR-370.pdf	Drainage Report Supplement for Bell Road Section 6	Val-Tec, Inc.		Electronic	PDF		08/25/92	City of Glendale			
273	DR-371.pdf	Hydrology and Hydraulics Report for Arrowhead Ranch Parcel 2	Clouse Engineering, Inc	Deer Valley south, 59th east, golf course west and Thunderbird Park north	Electronic	PDF		02/22/93	City of Glendale			
274	DR-372.pdf	Hydrology and Hydraulics Report for Arrowhead Ranch Parcel 5	Clouse Engineering, Inc		Electronic	PDF		02/15/94	City of Glendale			
275	DR-373.pdf	Hydrology and Hydraulics Report for Arrowhead Lakes units 5A and 5B	Clouse Engineering, Inc	along 59th ave alignment .25 mile north of beardsley	Electronic	PDF		03/27/93	City of Glendale			
276	DR-374.pdf	Hydrology and Hydraulics Report for Arrowhead Ranch Parcel 6	Clouse Engineering, Inc		Electronic	PDF		06/28/93	City of Glendale			
277	DR-375.pdf	Drainage Report for Arrowhead Ranch Parcel 10	Clouse Engineering, Inc		Electronic	PDF		09/15/95	City of Glendale			
278	DR-376.pdf	Northern/Orangewood Strom Drain Project, Construction Phasing	Wood, Patel & Associates, Inc.		Electronic	PDF		08/14/96	City of Glendale			
279	DR-377.pdf	Northern/Orangewood Strom Drain Project, concept/routing study	Wood, Patel & Associates, Inc.		Electronic	PDF		04/20/96	City of Glendale			
280	DR-378.pdf	Final Drainage Report for Mission Groves 2	Sage Engineering Corporation		Electronic	PDF		03/23/94	City of Glendale			
281	DR-379.pdf	Initial Drainage Report 67th Ave. - Peoria Ave. to Cactus Road	Entranco		Electronic	PDF		03/01/93	City of Glendale			
282	DR-380.pdf	Final Drainage Report Glendale NW Retail Site, Phase I Wal-Mart and Sam's Club	Kimley-Horn and Associates, Inc.		Electronic	PDF		02/01/01	City of Glendale			
283	DR-381.pdf	Arrowwood Supplement to the Drainage Report for Stormwater Pollution Best Management Plan	Erie & Associates, Inc		Electronic	PDF		09/14/00	City of Glendale			
284	DR-382.pdf	Final Drainage Report for Arrowhead Enclave	CMX, LLC		Electronic	PDF		03/07/97	City of Glendale			
285	DR-383.pdf	Drainage Report for Glen Harbor Air Business Park	Coe & Van Loo Consultants, Inc.		Electronic	PDF		03/01/92	City of Glendale			
286	DR-384.pdf	Preliminary Drainage Report for Missouri Estates	Clouse Engineering, Inc		Electronic	PDF		09/21/00	City of Glendale			
287	DR-385.pdf	Drainage Report for Missouri Ranch			Electronic	PDF		05/27/01	City of Glendale			
288	DR-386.pdf	Conceptual Drainage for Arrowhead Commons	Peterson Engineering, P.C.		Electronic	PDF		07/27/00	City of Glendale			
289	DR-387.pdf	Final Drainage Report for Olive Park Commercial Development	A-N West, Inc.	NEC of Olive Ave & 59th Ave	Electronic	PDF		11/08/02	City of Glendale			
290	DR-388.pdf	Brief Drainage Report for an 11 lot proposed subdivision	Fogt & Associates, Inc.	NWC of 44th & Frier Drives	Electronic	PDF		07/16/96	City of Glendale			
291	DR-389.pdf	Drainage Report for Kay-Bee Toy & Hobby Shops, Inc. Regional Distribution Center	Setter, Leach & Londstrom, Inc.		Electronic	PDF		08/13/93	City of Glendale			
292	DR-390.pdf	Drainage Report for Woolf Crossing	Olsson Associates		Electronic	PDF		06/01/07	City of Glendale			
293	DR-391.pdf	Master Drainage Study for Woolf Crossing	CMX, LLC		Electronic	PDF		09/01/05	City of Glendale			
294	DR-392.pdf	Final Drainage Report for Bethany Rose South	D & M Engineering,		Electronic	PDF		06/01/06	City of Glendale			
295	DR-393.pdf	Drainage Design Report for Signature at Aorangewood Estates	Hoskin Ryan Consultants	South of Orangewood Avea and east of 83rd Ave	Electronic	PDF		06/29/07	City of Glendale			
296	DR-394.pdf	Drainage Report for Office "A" Cornerstone at Camelback	Hunter Engineering, Inc.	Northeast corner of 99th Ave and Camelback Road	Electronic	PDF		June 2007	City of Glendale			
297	DR-395.pdf	Drainage Report for For The Glen at 83rd	Roper Engineering and Construction Management	Southeast corner of Glendale and 83rd Ave	Electronic	PDF		07/21/07	City of Glendale			
298	DR-396.pdf	Berkana on Northern Drainage Report	Rick Engineering Company	Southwest corner of Northern Ave and 44th Drive.	Electronic	PDF		04/26/07	City of Glendale			
299	DR-397.pdf	Glendale (51st & Olive) WalMart Neighborhood Market	Kimley-Horn and Associates, Inc.	Southwest corner of 51st Ave and Olive Ave.	Electronic	PDF		April 2007	City of Glendale			
300	DR-398.pdf	Drainage Report for Tots Unlimited	RCC Design Group, LLC	Southwest corner of Glendale Ave and 83rd Ave.	Electronic	PDF		03/24/08	City of Glendale			
301	DR-399.pdf	Final On-Site Drainage Report: Glendale (North) - Expansion (Walmart)	Kimley-Horn and Associates, Inc.	Boundy by Talavi Boulevard, 59th Ave, Bell Road, and 57th Ave.	Electronic	PDF		October 2007	City of Glendale			
302	DR-400.pdf	Final Drainage Report for Carmel Estates	Broadbent & Associates, Inc.	North of Union Hills Drive, west of 54th Ave, adjacent to 55th Ave drainage way	Electronic	PDF		September 2006	City of Glendale			
303	DR-401.pdf	Drainage Report Gateway Center	General Engineering Support LLC	North of Glendale Ave and east of 99th Ave	Electronic	PDF		07/17/07	City of Glendale			
304	DR-402.pdf	Drainage Report for Lund Cadillac	Wood, Patel & Associates, Inc.	North of Bell Road between 83rd Ave and the Augua Fria Freeway	Electronic	PDF		04/06/07	City of Glendale			
305	Split Flow Calculations	Example Split Flow Calculations from the Loop 303 split flows project	City of Glendale	Loop 303	Electronic	.xls	07/20/09	07/20/09	City of Glendale		From COG 7.20.09 Split Flow	
306	City of Glendale Zoning and General Plan	Land use, Zoning, and General Plan info for the City of Glendale. City of Peoria Storm Drain information	City of Glendale	City of Glendale Limits	Electronic	.shp, zip	08/10/09	08/10/09	City of Glendale		From COG 8 10 09	
307	Data collected from Flood Control District	Topography , storm drain inventory and floodplain information from the Flood Control District	FCDMC	Project Boundary	Electronic	.shp	08/03/09	08/03/09	Flood Control District		From FCDMC 8 3 09	
308	Studies and Data for Mayrvale and ACDC	ACDC ADMS, HEC-1 Data, and Maryvale ADMS Exhibits	FCDMC	ACDC Drainage Areas, Maryvale Study Areas	Electronic	PDF	08/07/09	08/07/09	Flood Control District		From FCDMC 8 7 09	
309	City of Phoenix Land Use	Shape File for City of Phoenix Land Use for project area	City of Phoenix	Project Boundaries that are within the city limits	Electronic	.shp	08/16/09	08/16/09	City of Phoenix		From COPhx 8 18 09	
310	Metro Phoenix ADMS Information	Reports and Information regarding Phoenix Metro Studies	EEC, Wood Pattel	Phoenix Metro Boundaries	Electronic	PDF	08/07/09	08/07/09	Flood Control District		From FCDMC 8 7 09	
311	City of Phoenix Storm Drain	Shape files for City of Phoenix Storm Drain locations	City of Phoenix	Project Boundaries that are within the city limits	Electronic	.shp	08/21/09	08/21/09	City of Phoenix		From COP 8 21 09	

312	City of Surprise	General Plan and Land Use Maps	City of Surprise	City of Surprise	Electronic	PDF	08/26/09	08/26/09	City of Surprise		From_Surprise_website_8_26_09	
313	City of Youngtown	General Plan Maps for the City of Youngtown	City of Youngtwon	City of Youngtown	Electronic	PDF	08/26/09	08/26/09	City of Surprise		From_Youngtown_website_8_26_09	
314	Loop 303/White Tanks CD1	CD containing CAD, GIS, HEC-1/DDMSW, and Reports	HDR Engineering, Inc.	Loop 303	Electronic	CD	09/28/09		Flood Control District		CD_Stakeholders_FinalSubmittal_090409	
315	Loop 303/White Tanks CD2	CD containing Data Collection Memo	HDR Engineering, Inc.	Loop 303	Electronic	CD	09/28/09		Flood Control District		Loop 303-White Tanks	
316	FY 92/93 4 ft. Aerials	Aerials dated 1992/1993 for project area	FCDMC	Entire area	Electronic	tiff	10/15/09	October 2009	Flood Control District		From_FCDMC_10_15_09	
317	Detention Basin As-Builts	Regional Detention Basin As-Builts	City of Glendale	City of Glendale	Electronic	tiff	11/13/09	11/12/09	City of Glendale		From_COG_11_13_09	
318	Storm Drain Studies Along Gr	Determination of Mapping and Flood Zone Changes and Elevation Certificates	Project Engineering Consultants, LTD.	City of Glendale	Hard Copy	Report	11/13/09	11/06/09	City of Glendale		From_COG_11_13_09	
319	ADOT As-Builts	Various Adot As-builts for I-17, 101, 60 and I-10	ADOT	Maryvale/Glendale	Electronic	PDF	11/12/09	11/11/09	ADOT	2 disks	From_ADOT_11_12_09	
320	ADOT As-Builts	Various ADOT As-builts for I-10 and L101	ADOT	Maryvale/Glendale	Electronic	PDF	11/30/09	11/30/09	ADOT	1 disk	From_ADOT_11_30_09	
321	ADOT As-Builts	Various ADOT As-Builts for L101	ADOT	Maryvale/Glendale	Electronic	PDF	12/07/09	12/07/09	ADOT	1 disk	From_FCDMC_12_5_09	
322	Bethany Home Outfall Channe	Clomr and LOMR for Bethany Home outfall Channel	FCDMC	Glendale	Electronic	PDF	12/07/09	12/07/09	FCDMC			
323	83rd Avenue/Pinnacle Peak Road Drainage Improvements	Storm Drain As-built Records	FCDMC	Peoria	Electronic	PDF	01/04/10	January 2007	FCDMC		From_FCDMC_01_04_10	
324	84th Avenue/Pinnacle Peak Road Drainage Improvements Final Drainage Report	Drainage Report for 8rrd Avenue/Pinnacle Peak Storm Drain	JE Jacobs	Peoria	Electronic	PDF	01/04/10	January 2006	FCDMC		From_FCDMC_01_04_10	
325	84th Avenue/Pinnacle Peak Road Drainage Improvements Final Drainage Report Supplement	Drainage Report for 8rrd Avenue/Pinnacle Peak Storm Drain	JE Jacobs	Peoria	Electronic	PDF	01/04/10	March 2006	FCDMC		From_FCDMC_01_04_10	
326	84th Avenue/Pinnacle Peak Road Drainage Improvements Special Structures	Report for 8rrd Avenue/Pinnacle Peak Storm Drain	JE Jacobs	Peoria	Electronic	PDF	01/04/10	January 2006	FCDMC		From_FCDMC_01_04_10	
327	84th Avenue/Pinnacle Peak Road Drainage Improvements Structural Design Calculations	Report for 8rrd Avenue/Pinnacle Peak Storm Drain	JE Jacobs	Peoria	Electronic	PDF	01/04/10	February 2007	FCDMC		From_FCDMC_01_04_10	
328	85th Avenue/Pinnacle Peak Road Drainage Improvements Final Quantities and Cost Estimate	Report for 8rrd Avenue/Pinnacle Peak Storm Drain	JE Jacobs	Peoria	Electronic	PDF	01/04/10	February 2007	FCDMC		From_FCDMC_01_04_10	

Appendix C Hydraulic Capacity Analysis

City of Glendale Stormwater Drainage Systems

Id	STORM DRAIN SYSTEM/OUTFALL	PIPE SIZE (INCHES)	LOCATION	TO_LOCATION	FROM_LOCATION	TYPE	LENGTH	
4	SKUNK CREEK	24	W BELL RD	N 70TH LN	N 69TH AVE	PIPE	1311	
3	SKUNK CREEK	30	W BELL RD	SKUNK CREEK (WASH)	N 70TH LN	PIPE	529	
151	SKUNK CREEK	24	W UNION HILLS DR	N 67TH AVE	W MCRAE WAY	PIPE	2819	
150	SKUNK CREEK	33	N 67TH AVE	SKUNK CREEK (WASH)	W UNION HILLS DR	PIPE	3225	
5	SKUNK CREEK	24	N 67TH AVE	SKUNK CREEK (WASH)	W CAMINO DE LA CAMPANA	PIPE	528	
6	SKUNK CREEK	24	W ST JOHN RD	N 75TH AVE	N ARROWHEAD TOWN CTR ACCESS*	PIPE	321	
75	SKUNK CREEK	24	W BELL RD	N 75TH AVE	N 73RD AVE	PIPE	2827	
2	SKUNK CREEK	36	N 75TH AVE	W GROVERS AVE	W WAGONER RD	PIPE	1972	
115	SKUNK CREEK	78	N 75TH AVE	SKUNK CREEK (WASH)	W GROVERS AVE	PIPE	3491	
77	SKUNK CREEK	24	W BELL RD	ARROWHEAD MALL	N 77TH AVE	PIPE	565	
78	SKUNK CREEK	24	W BELL RD	ARROWHEAD MALL	N 77TH AVE	PIPE	924	
114	SKUNK CREEK	24	N 79TH AVE	1000FT NORTH OF W ST JOHN RD	1470FT NORTH OF W ST JOHN RD	PIPE	474	
113	SKUNK CREEK	30	N 79TH AVE	W CAMPO BELLO DR	W ST JOHN RD	PIPE	2673	
112	SKUNK CREEK	36	N 79TH AVE	W BELL RD	W CAMPO BELLO DR	PIPE	1395	
79	SKUNK CREEK	30	W BELL RD	850FT WEST OF N 77TH AVE	650FT WEST OF N 77TH AVE	PIPE	197	
80	SKUNK CREEK	36	W BELL RD	320 FT EAST OF N 79TH AVE	480FT EAST OF N 79TH AVE	PIPE	154	
117	SKUNK CREEK	30	W BELL RD	N 79TH AVE	N 78TH DR	PIPE	434	
103	SKUNK CREEK	24	N 70TH AVE	N 74TH DR	N 67TH DR	PIPE	1552	Confirm
98	SKUNK CREEK	30	W UNION HILLS DR	N 74TH DR	N 70TH AVE	PIPE	2521	
94	SKUNK CREEK	0	N 71ST DR	SKUNK CREEK (WASH)	W UNION HILLS DR	CHANNEL	4868	
95	SKUNK CREEK	0	N 55TH AVE	SKUNK CREEK (WASH)	W BEARDSLEY RD	CHANNEL	4040	
101	SKUNK CREEK	0	SKUNK CREEK	N 73RD AVE	N 51ST AVE	CHANNEL	17865	
93	NEW RIVER	0	W WILLIAMS RD	NEW RIVER (WASH)	N 67TH AVE	CHANNEL	5619	
97	NEW RIVER	0	W PATRICK LN	NEW RIVER (WASH)	N 71ST AVE	CHANNEL	2472	
1	NEW RIVER	36	W UNION HILLS DR	LOOP 101	N 75TH AVE	PIPE	3490	
88	NEW RIVER	0	NEW RIVER	W BELL RD	BEARDSLEY ROAD	CHANNEL	22376	
99	NEW RIVER	0	NEW RIVER	W CAMELBACK RD	W NORTHERN AVE	CHANNEL	18166	
28	OLIVE STORM DRAIN	60	W OLIVE AVE	N 51ST AVE	N 47TH AVE	PIPE	2833	
29	OLIVE STORM DRAIN	78	W OLIVE AVE	N 55TH AVE	N 51ST AVE	PIPE	2485	
30	OLIVE STORM DRAIN	84	W OLIVE AVE	N 59TH AVE	N 55TH AVE	PIPE	2767	
74	OLIVE STORM DRAIN	42	N 59TH AVE	W VOGEL AVE	W BROWN ST	PIPE	2427	
73	OLIVE STORM DRAIN	48	N 59TH AVE	W SUNNYSLOPE LN	W VOGEL AVE	PIPE	626	
32	OLIVE STORM DRAIN	54	N 59TH AVE	W OLIVE AVE	W SUNNYSLOPE LN	PIPE	968	
7	OLIVE STORM DRAIN	24	N 59TH AVE	W LARKSPUR DR	W MARSHALL RANCH RD	PIPE	1329	
8	OLIVE STORM DRAIN	27	N 59TH AVE	W CACTUS RD	W LARKSPUR DR	PIPE	1002	
9	OLIVE STORM DRAIN	24	W CACTUS RD	N 56TH AVE	N 54TH AVE	PIPE	1190	
13	OLIVE STORM DRAIN	27	W CACTUS RD	N 57TH AVE	N 56TH AVE	PIPE	799	
10	OLIVE STORM DRAIN	30	W CACTUS RD	N 59TH AVE	N 57TH AVE	PIPE	1261	
	OLIVE STORM DRAIN	30	N 59TH AVE	W SUNNYSIDE DR	W CACTUS RD	PIPE	1300	
11	OLIVE STORM DRAIN	24	W SUNNYSIDE DR	N 59TH AVE	N 58TH DR	PIPE	240	
12	OLIVE STORM DRAIN	36	N 59TH AVE	W CHOLLA ST	W SUNNYSIDE DR	PIPE	2748	
	OLIVE STORM DRAIN	54	N 59TH AVE	W DESERT COVE AVE	W CHOLLA ST	PIPE	1286	
14	OLIVE STORM DRAIN	36	W DESERT COVE AVE	N 58TH DR	N 57TH AVE	PIPE	1070	
15	OLIVE STORM DRAIN	48	W DESERT COVE AVE	N 59TH AVE	N 58TH DR	PIPE	194	
16	OLIVE STORM DRAIN	60	N 59TH AVE	W PEORIA AVE	W DESERT COVE AVE	PIPE	2729	
18	OLIVE STORM DRAIN	36	W PEORIA AVE	N 55TH AVE	N 53RD AVE	PIPE	1320	
21	OLIVE STORM DRAIN	48	W PEORIA AVE	N 59TH AVE	N 55TH AVE	PIPE	2641	
20	OLIVE STORM DRAIN	78	N 59TH AVE	W BROWN ST	W PEORIA AVE	PIPE	1231	
19	OLIVE STORM DRAIN	60	W BROWN ST	N 60TH LN	N 59TH AVE	PIPE	1446	
22	OLIVE STORM DRAIN	36	N 63RD AVE	W MOUNTAIN VIEW RD	W BROWN ST	PIPE	1773	
23	OLIVE STORM DRAIN	42	N 63RD AVE	W OLIVE AVE	W MOUNTAIN VIEW RD	PIPE	2715	
31	OLIVE STORM DRAIN	90	W OLIVE AVE	N 65TH AVE	N 59TH AVE	PIPE	3834	
111	OLIVE STORM DRAIN	96	W OLIVE AVE	N 67TH AVE	N 65TH AVE	PIPE	1249	
120	OLIVE STORM DRAIN	48	N 67TH AVE	W SIERRA ST	W SUNNYSIDE DR	PIPE	662	
81	OLIVE STORM DRAIN	54	N 67TH AVE	W DESERT COVE AVE	W SIERRA ST	PIPE	2072	

City of Glendale Stormwater Drainage Systems

Id	STORM DRAIN SYSTEM/OUTFALL	PIPE SIZE (INCHES)	LOCATION	TO_LOCATION	FROM_LOCATION	TYPE	LENGTH	
119	OLIVE STORM DRAIN	60	N 67TH AVE	W PEORIA AVE	W DESERT COVE AVE	PIPE	1222	
17	OLIVE STORM DRAIN	60	N 67TH AVE	W MOUNTAIN VIEW RD	W PEORIA AVE	PIPE	2679	
25	OLIVE STORM DRAIN	24	W PALO VERDE AVE	N 67TH AVE	N 66TH DR	PIPE	233	
27	OLIVE STORM DRAIN	66	N 67TH AVE	W SUNNYSLOPE LN	W MOUNTAIN VIEW RD	PIPE	1623	
24	OLIVE STORM DRAIN	36	W SUNNYSLOPE LN	N 67TH AVE	N 66TH DR	PIPE	253	
26	OLIVE STORM DRAIN	72	N 67TH AVE	W OLIVE AVE	W SUNNYSLOPE LN	PIPE	1242	
33	OLIVE STORM DRAIN	102	W OLIVE AVE	N 69TH AVE	N 67TH AVE	PIPE	1476	
107	GLENDALE/ORANGEWOOD STORM DRAIN	42	N 58TH DR	W GRAND AVE	N 58TH DR	PIPE	196	
148	GLENDALE/ORANGEWOOD STORM DRAIN	30	N 59TH AVE	W OCOTILLO RD	W GLENDALE AVE	PIPE	1217	
149	GLENDALE/ORANGEWOOD STORM DRAIN	36	N 59TH AVE	W MARYLAND AVE	W OCOTILLO RD	PIPE	1263	
54	GLENDALE/ORANGEWOOD STORM DRAIN	24	W GRAND AVE	W MYRTLE AVE	W PALMAIRE AVE	PIPE	1331	
108	GLENDALE/ORANGEWOOD STORM DRAIN	60	W GRAND AVE	N 59TH AVE	W GLENDALE AVE	PIPE	272	
109	GLENDALE/ORANGEWOOD STORM DRAIN	72	N 59TH AVE	W GLENN DR	W GLENDALE AVE	PIPE	286	
110	GLENDALE/ORANGEWOOD STORM DRAIN	24	W GLENDALE AVE	N 58TH DR	N 54TH DR	PIPE	2682	
122	GLENDALE/ORANGEWOOD STORM DRAIN	78	W GRAND AVE	N 59TH DR	W GLENN DR	PIPE	873	
121	GLENDALE/ORANGEWOOD STORM DRAIN	84	W GRAND AVE	W GRAND AVE	N 59TH DR	PIPE	397	Connects to 108-inch
123	GLENDALE/ORANGEWOOD STORM DRAIN	24	W GRAND AVE	350FT SOUTH OF ORANGEWOOD AVE	N 62ND AVE	PIPE	728	
53	GLENDALE/ORANGEWOOD STORM DRAIN	30	W GRAND AVE	W ORANGEWOOD AVE	350FT SOUTH OF ORANGEWOOD AVE	PIPE	341	Connects to 108-inch
37	GLENDALE/ORANGEWOOD STORM DRAIN	30	N 59TH AVE	W BELMONT AVE	W FRIER DR	PIPE	126	end of Northern Avenue Storm Drain
38	GLENDALE/ORANGEWOOD STORM DRAIN	33	N 59TH AVE	W MORTEN AVE	W BELMONT AVE	PIPE	320	
39	GLENDALE/ORANGEWOOD STORM DRAIN	36	N 59TH AVE	W VISTA AVE	W MORTEN AVE	PIPE	303	
40	GLENDALE/ORANGEWOOD STORM DRAIN	39	N 59TH AVE	W ORANGEWOOD AVE	W VISTA AVE	PIPE	367	
36	GLENDALE/ORANGEWOOD STORM DRAIN	42	W ORANGEWOOD AVE	N 63RD AVE	N 59TH AVE	PIPE	2594	Connects to 108-inch
55	GLENDALE/ORANGEWOOD STORM DRAIN	108	W GRAND AVE	W FRIER DR	W GLENN DR	PIPE	4211	To Basin
118	GLENDALE/ORANGEWOOD STORM DRAIN	60	W NORTHERN AVE	N 53RD AVE	N 47TH AVE	PIPE	4050	end
72	GLENDALE/ORANGEWOOD STORM DRAIN	72	W NORTHERN AVE	N 63RD AVE	N 53RD AVE	PIPE	6706	
42	GLENDALE/ORANGEWOOD STORM DRAIN	42	W NORTHERN AVE	N 65TH AVE	N 63RD AVE	PIPE	1193	by-pass of 63rd Avenue Basin
41	GLENDALE/ORANGEWOOD STORM DRAIN	43	W GRAND AVE	W FRIER DR	W ORANGEWOOD AVE	PIPE	1858	Street Drainage in Grand Avenue
91	GLENDALE/ORANGEWOOD STORM DRAIN	36	N 67TH AVE	W ROYAL PALM RD	W BUTLER DR	PIPE	1380	To ADOT basin north of Northern
34	GLENDALE/ORANGEWOOD STORM DRAIN	54	N 67TH AVE	W NORTHERN AVE	N GRAND AVE	PIPE	1661	
	GLENDALE/ORANGEWOOD STORM DRAIN	60	W NORTHERN AVE	N 67TH AVE	N 65TH AVE	PIPE	1661	To basin
43	GLENDALE/ORANGEWOOD STORM DRAIN	42	N 65TH AVE	W NORTHERN AVE	W FRIER DR	PIPE	1132	by-pass of 63rd Avenue Basin
44	GLENDALE/ORANGEWOOD STORM DRAIN	60	W ORANGEWOOD AVE	W FRIER DR	W ORANGEWOOD AVE	PIPE	2065	63rd Avenue Basin Outlet
56	GLENDALE/ORANGEWOOD STORM DRAIN	66	W ORANGEWOOD AVE	N 69TH AVE	N 65TH AVE	PIPE	2052	
45	GLENDALE/ORANGEWOOD STORM DRAIN	42	W ORANGEWOOD AVE	N 71ST AVE	N 69TH AVE	PIPE	1113	
106	GLENDALE/ORANGEWOOD STORM DRAIN	42	W ORANGEWOOD AVE	N 72ND AVE	N 71ST AVE	PIPE	486	
105	GLENDALE/ORANGEWOOD STORM DRAIN	48	W ORANGEWOOD AVE	N 73RD AVE	N 72ND AVE	PIPE	947	
46	GLENDALE/ORANGEWOOD STORM DRAIN	30	W ORANGEWOOD AVE	N 74TH AVE	N 73RD AVE	PIPE	509	
47	GLENDALE/ORANGEWOOD STORM DRAIN	48	W ORANGEWOOD AVE	N 75TH AVE	N 74TH AVE	PIPE	881	
50	GLENDALE/ORANGEWOOD STORM DRAIN	60	W ORANGEWOOD AVE	300FT WEST OF N 75TH AVE	N 75TH AVE	PIPE	44	Confirm
48	GLENDALE/ORANGEWOOD STORM DRAIN	24	N 75TH AVE	W CAROLE LN	W FRIER DR	PIPE	1087	
49	GLENDALE/ORANGEWOOD STORM DRAIN	30	N 75TH AVE	W ORANGEWOOD AVE	W CAROLE LN	PIPE	859	
137	GLENDALE/ORANGEWOOD STORM DRAIN	24	N 75TH AVE	W ORANGEWOOD AVE	W MYRTLE AVE	PIPE	1074	
138	GLENDALE/ORANGEWOOD STORM DRAIN	30	N 75TH AVE	W MYRTLE AVE	W GLENN DR	PIPE	846	
51	GLENDALE/ORANGEWOOD STORM DRAIN	48	W ORANGEWOOD AVE	N 77TH LN	N 75TH AVE	PIPE	1222	
57	GLENDALE/ORANGEWOOD STORM DRAIN	60	W ORANGEWOOD AVE	N 78TH AVE	N 77TH LN	PIPE	659	
35	GLENDALE/ORANGEWOOD STORM DRAIN	66	W ORANGEWOOD AVE	N 83RD AVE	N 78TH AVE	PIPE	3297	
52	GLENDALE/ORANGEWOOD STORM DRAIN	72	N 83RD AVE	W GLENDALE AVE	N 78TH AVE	PIPE	2644	
58	GLENDALE/ORANGEWOOD STORM DRAIN	84	W GLENDALE AVE	N 87TH AVE	N 83RD AVE	PIPE	1984	
59	GLENDALE/ORANGEWOOD STORM DRAIN	24	W GLENDALE AVE	N ZANJERO BLVD	N 87TH AVE	PIPE	3985	
60	GLENDALE/ORANGEWOOD STORM DRAIN	96	W GLENDALE AVE	N 95TH AVE	N ZANJERO BLVD	PIPE	1955	
61	GLENDALE/ORANGEWOOD STORM DRAIN	102	W GLENDALE AVE	LOOP 101	N 95TH AVE	PIPE	1583	
104	GLENDALE/ORANGEWOOD STORM DRAIN	72	W GLENDALE AVE	LOOP 101	N 91ST AVE	PIPE	3686	Westgate Drainage
65	BETHANY HOME OUTFALL CHANNEL	30	W GLENDALE AVE	N 45TH AVE	N 44TH AVE	PIPE	768	Maryland Lakes System
64	BETHANY HOME OUTFALL CHANNEL	48	W GLENDALE AVE	N 46TH AVE	N 45TH AVE	PIPE	598	Maryland Lakes System
83	BETHANY HOME OUTFALL CHANNEL	54	W GLENDALE AVE	N 47TH AVE	N 46TH AVE	PIPE	618	Maryland Lakes System

City of Glendale Stormwater Drainage Systems

Id	STORM DRAIN SYSTEM/OUTFALL	PIPE SIZE (INCHES)	LOCATION	TO_LOCATION	FROM_LOCATION	TYPE	LENGTH	
63	BETHANY HOME OUTFALL CHANNEL	54	N 47TH AVE	N 47TH AVE	N 46TH AVE	PIPE	618	Is this a duplicate of above with an error?
62	BETHANY HOME OUTFALL CHANNEL	60	N 47TH AVE	W OCOTILLO RD	W GLENDALE AVE	PIPE	1337	Maryland Lakes System
84	BETHANY HOME OUTFALL CHANNEL	66	N 47TH AVE	W MARYLAND AVE	W OCOTILLO RD	PIPE	1470	Maryland Lakes System
66	BETHANY HOME OUTFALL CHANNEL	30	W GLENDALE AVE	N 50TH AVE	N 49TH AVE	PIPE	445	Rose Park System
68	BETHANY HOME OUTFALL CHANNEL	36	W GLENDALE AVE	N 50TH AVE	N 48TH AVE	PIPE	743	Rose Park System
67	BETHANY HOME OUTFALL CHANNEL	48	N 49TH AVE	W OCOTILLO RD	W GLENDALE AVE	PIPE	1329	Rose Park System
85	BETHANY HOME OUTFALL CHANNEL	54	N 49TH AVE	W MARYLAND AVE	W OCOTILLO RD	PIPE	1319	Rose Park System
86	BETHANY HOME OUTFALL CHANNEL	30	N 51ST AVE	W ROSE LN	W MARLETTE AVE	PIPE	434	To ADOT portion of Rose Lane Basin
87	BETHANY HOME OUTFALL CHANNEL	24	N 51ST AVE	W CAVALIER DR	W CAVALIER DR	PIPE	2667	To ADOT portion of Rose Lane Basin
69	BETHANY HOME OUTFALL CHANNEL	24	W GRAND AVE	N 55TH AVE	N 56TH AVE	PIPE	1439	To ADOT portion of Rose Lane Basin
70	BETHANY HOME OUTFALL CHANNEL	30	W GRAND AVE	N 51ST AVE	N 55TH AVE	PIPE	3352	To ADOT portion of Rose Lane Basin
128	BETHANY HOME OUTFALL CHANNEL	54	W CAMELBACK RD	N 59TH AVE	N 57TH AVE	PIPE	1349	Camelback Road Storm Drain System
129	BETHANY HOME OUTFALL CHANNEL	78	N 59TH AVE	W CAMELBACK RD	W COLTER ST	PIPE	1279	Camelback Road Storm Drain System
127	BETHANY HOME OUTFALL CHANNEL	84	W CAMELBACK RD	N 63RD AVE	N 59TH AVE	PIPE	2642	Camelback Road Storm Drain System
130	BETHANY HOME OUTFALL CHANNEL	60	N 63RD AVE	W CAMELBACK RD	W WINDSOR BLVD	PIPE	614	Camelback Road Storm Drain System
126	BETHANY HOME OUTFALL CHANNEL	90	W CAMELBACK RD	N 65TH AVE	N 63RD AVE	PIPE	1413	Camelback Road Storm Drain System
125	BETHANY HOME OUTFALL CHANNEL	96	W CAMELBACK RD	N 67TH AVE	N 65TH AVE	PIPE	1061	Camelback Road Storm Drain System
131	BETHANY HOME OUTFALL CHANNEL	78	N 67TH AVE	W CAMELBACK RD	W COLTER ST	PIPE	1289	Camelback Road Storm Drain System
124	BETHANY HOME OUTFALL CHANNEL	102	W CAMELBACK RD	N 75TH AVE	N 67TH AVE	PIPE	4997	Camelback Road Storm Drain System
71	BETHANY HOME OUTFALL CHANNEL	108	W BETHANY HOME RD	BETHANY HOME OUTFALL CHANNEL	N 79TH AVE	PIPE	2071	
82	BETHANY HOME OUTFALL CHANNEL	0	BETHANY HOME OUTFALL CHANNEL	NEW RIVER (WASH)	W CAMELBACK RD	CHANNEL	24834	
90	ADOT DRAINAGE CHANNEL	48	W CAMELBACK RD	400FT FROM LOOP 101	N 95TH AVE	PIPE	1164	
102	ADOT DRAINAGE CHANNEL	36	W CAMELBACK RD	LOOP 101	400FT FROM LOOP 101	PIPE	242	
100	ADOT DRAINAGE CHANNEL	0	ADOT DRAINAGE CHANNEL	W CAMELBACK RD	W NORTHERN AVE	CHANNEL	16843	
89	ADOT DRAINAGE CHANNEL	0	W NORTHERN AVE	NEW RIVER (WASH)	LOOP 101	CHANNEL	2394	
92	MISC GLENDALE CHANNELS	0	N 59TH AVE	W MELINDA LN	W PINNACLE PEAK RD	CHANNEL	6077	To Arrowhead Lakes
134	MISC GLENDALE STORM DRAINS	24	W BETHANY HOME RD	N 53RD DR	N 52ND AVE	PIPE	330	
133	MISC GLENDALE STORM DRAINS	27	W BETHANY HOME RD	N 55TH AVE	N 53RD DR	PIPE	1016	
132	MISC GLENDALE STORM DRAINS	42	W BETHANY HOME RD	N 58TH AVE	N 55TH AVE	PIPE	2033	
135	MISC GLENDALE STORM DRAINS	24	W GLENDALE AVE	N 64TH AVE	N 63RD AVE	PIPE	776	
136	MISC GLENDALE STORM DRAINS	24	W GLENDALE AVE	N 67TH AVE	N 65TH AVE	PIPE	1121	
152	ARIZONA CANAL DIVERSION CHANNEL	36	N 67TH AVE	W KINGS AVE	W BELL RD	PIPE	1791	
153	ARIZONA CANAL DIVERSION CHANNEL	42	N 67TH AVE	W PARADISE LN	W KINGS AVE	PIPE	656	
156	ARIZONA CANAL DIVERSION CHANNEL	36	W PARADISE LN	N 67TH AVE	N 65TH DR	PIPE	970	
154	ARIZONA CANAL DIVERSION CHANNEL	60	N 67TH AVE	W GREENWAY RD	W PARADISE LN	PIPE	2626	
157	ARIZONA CANAL DIVERSION CHANNEL	36	W GREENWAY RD	N 67TH AVE	N 66TH AVE	PIPE	1043	
155	ARIZONA CANAL DIVERSION CHANNEL	84	N 67TH AVE	ACDC (CANAL)	W GREENWAY RD	PIPE	1168	Confiirm this is on 67th
143	ARIZONA CANAL DIVERSION CHANNEL	36	W THUNDERBIRD RD	N 53RD AVE	N 52ND DR	PIPE	519	
142	ARIZONA CANAL DIVERSION CHANNEL	42	W THUNDERBIRD RD	N 55TH AVE	N 53RD AVE	PIPE	989	
141	ARIZONA CANAL DIVERSION CHANNEL	60	W THUNDERBIRD RD	N 57TH DR	N 55TH AVE	PIPE	1987	
140	ARIZONA CANAL DIVERSION CHANNEL	66	W THUNDERBIRD RD	N 59TH AVE	N 57TH DR	PIPE	607	
144	ARIZONA CANAL DIVERSION CHANNEL	42	N 59TH AVE	W KINGS AVE	W BELL RD	PIPE	1622	
145	ARIZONA CANAL DIVERSION CHANNEL	54	N 59TH AVE	W GREENWAY RD	W KINGS AVE	PIPE	3782	
96	ARIZONA CANAL DIVERSION CHANNEL	0	W INTERNATIONAL BLVD	N 59TH AVE	W GREENWAY RD	CHANNEL	4006	Channel to Basin N of Acoma
146	ARIZONA CANAL DIVERSION CHANNEL	78	W GELDING DR	W ACOMA DR	W GREENWAY RD	PIPE	2508	To Basin N of Acoma
147	ARIZONA CANAL DIVERSION CHANNEL	60	N 59TH AVE	W ACOMA DR	W THUNDERBIRD RD	PIPE	2770	
139	ARIZONA CANAL DIVERSION CHANNEL	96	W THUNDERBIRD RD	ACDC Canal	N 59TH AVE	PIPE	821	

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
33	24	RGRCP	330	1238.66	1236.87	0.00440	0.0130	3.14	6.28	0.50	15
34	24	RGRCP	340	1236.87	1235.29	0.00440	0.0130	3.14	6.28	0.50	15
35	24	RGRCP	318	1235.29	1233.75	0.00440	0.0130	3.14	6.28	0.50	15
36	24	RGRCP	330	1233.73	1229.97	0.01182	0.0130	3.14	6.28	0.50	25
37	24	RGRCP	313	1229.97	1226.14	0.01180	0.0130	3.14	6.28	0.50	25
38	30	RGRCP	420	1225.66	1224.60	0.00303	0.0130	4.91	7.85	0.63	23
41	24	RGRCP	43	0.00	1226.27	NA	0.0130	3.14	6.28	0.50	#VALUE!
55	30	RGRCP	309	1224.85	1224.25	0.00160	0.0130	4.91	7.85	0.63	16
56	30	RGRCP	285	1225.18	1224.85	0.00120	0.0130	4.91	7.85	0.63	14
57	30	RGRCP	305	1225.48	1225.18	0.00100	0.0130	4.91	7.85	0.63	13
58	30	RGRCP	430	1225.86	1225.48	0.00100	0.0130	4.91	7.85	0.63	13
59	30	RGRCP	330	1226.12	1225.86	0.00100	0.0130	4.91	7.85	0.63	13
60	30	RGRCP	437	1226.60	1226.12	0.00100	0.0130	4.91	7.85	0.63	13
61	24	RGRCP	81	1228.74	1228.48	0.00200	0.0130	3.14	6.28	0.50	10
62	24	RGRCP	68	1228.48	1228.34	0.00200	0.0130	3.14	6.28	0.50	10
70	36	RGRCP	29	0.00	0.00	0.00200	0.0130	7.07	9.42	0.75	30
71	36	RGRCP	290	1222.13	1221.55	0.00200	0.0130	7.07	9.42	0.75	30
72	36	RGRCP	358	1222.63	1222.13	0.00160	0.0130	7.07	9.42	0.75	27
73	24	RGRCP	30	1224.42	1222.63	0.01000	0.0130	3.14	6.28	0.50	23
86	24	RGRCP	330	1252.19	1251.45	0.00200	0.0130	3.14	6.28	0.50	10
87	24	RGRCP	331	1251.39	1250.62	0.00200	0.0130	3.14	6.28	0.50	10
88	24	RGRCP	330	1250.62	1249.83	0.00200	0.0130	3.14	6.28	0.50	10
89	24	RGRCP	330	1249.76	1248.84	0.00260	0.0130	3.14	6.28	0.50	12
90	24	RGRCP	330	1248.78	1247.48	0.00360	0.0130	3.14	6.28	0.50	14
91	24	RGRCP	315	1247.42	1245.96	0.00460	0.0130	3.14	6.28	0.50	15
92	24	RGRCP	330	1245.96	1244.24	0.00460	0.0130	3.14	6.28	0.50	15
93	24	RGRCP	330	1244.12	1242.21	0.00600	0.0130	3.14	6.28	0.50	18
94	24	RGRCP	110	1242.14	1241.65	0.00436	0.0130	3.14	6.28	0.50	15
95	24	RGRCP	15	1232.69	1229.00	0.25330	0.0130	3.14	6.28	0.50	114
96	24	RGRCP	47	1241.54	1241.45	0.00423	0.0130	3.14	6.28	0.50	15
97	24	RGRCP	31	1229.00	1228.26	0.02460	0.0130	3.14	6.28	0.50	36
98	30	RGRCP	96	1224.60	1224.21	0.00300	0.0130	4.91	7.85	0.63	23
99	24	RGRCP	40	1236.23	1236.06	0.00290	0.0130	3.14	6.28	0.50	12
100	24	RCP	103	1236.69	1236.28	0.00280	0.0130	3.14	6.28	0.50	12
101	33	RCP	272	1236.06	1234.98	0.00233	0.0130	5.94	8.64	0.69	26
102	33	RCP	497	1234.98	1233.73	0.00233	0.0130	5.94	8.64	0.69	26
103	33	RCP	408	1233.73	1232.90	0.00233	0.0130	5.94	8.64	0.69	26
104	24	RCP	40	1231.96	1230.71	0.03350	0.0130	3.14	6.28	0.50	42
105	33	RCP	235	1232.90	1231.96	0.00370	0.0130	5.94	8.64	0.69	32
106	33	RCP	252	1231.96	1231.12	0.00370	0.0130	5.94	8.64	0.69	32
107	33	RCP	398	1231.12	1229.65	0.00370	0.0130	5.94	8.64	0.69	32
108	33	RCP	142	1229.65	1228.96	0.00488	0.0130	5.94	8.64	0.69	37
109	33	RCP	256	1228.96	1227.71	0.00488	0.0130	5.94	8.64	0.69	37
110	30	RGRCP	96	1224.25	1224.22	0.00160	0.0130	4.91	7.85	0.63	16
111	24	RGRCP	220	1218.83	1217.34	0.00680	0.0130	3.14	6.28	0.50	19
112	24	RGRCP	220	1217.34	1215.84	0.00680	0.0130	3.14	6.28	0.50	19
113	30	RGRCP	350	1214.30	1211.50	0.00800	0.0130	4.91	7.85	0.63	37
114	36	RGRCP	285	1211.00	1209.86	0.00400	0.0130	7.07	9.42	0.75	42
115	36	RGRCP	340	1209.86	1208.09	0.00520	0.0130	7.07	9.42	0.75	48
116	36	RGRCP	325	1208.09	1204.71	0.01040	0.0130	7.07	9.42	0.75	68
117	36	RGRCP	130	1222.86	1222.63	0.00160	0.0130	7.07	9.42	0.75	27
118	36	RGRCP	252	1223.05	1222.86	0.00120	0.0130	7.07	9.42	0.75	23
119	36	RGRCP	320	1223.55	1223.05	0.00120	0.0130	7.07	9.42	0.75	23
120	30	RGRCP	300	1224.39	1223.55	0.00160	0.0130	4.91	7.85	0.63	16
121	30	RGRCP	323	1224.98	1224.39	0.00160	0.0130	4.91	7.85	0.63	16
122	30	RGRCP	104	1225.07	1224.98	0.00160	0.0130	4.91	7.85	0.63	16
123	24	RGRCP	288	1226.80	1225.72	0.00240	0.0130	3.14	6.28	0.50	11
124	24	RGRCP	285	1227.13	1226.80	0.00240	0.0130	3.14	6.28	0.50	11
125	24	RGRCP	300	1227.73	1227.13	0.00200	0.0130	3.14	6.28	0.50	10
126	24	RGRCP	318	1228.21	1227.73	0.00200	0.0130	3.14	6.28	0.50	10
127	24	RGRCP	250	1200.20	1199.88	0.00440	0.0130	3.14	6.28	0.50	15
128	24	RGRCP	256	1199.88	1197.99	0.00400	0.0130	3.14	6.28	0.50	14
129	24	RGRCP	35	1197.69	1197.79	0.00100	0.0130	3.14	6.28	0.50	7
130	24	RGRCP	14	1197.79	1197.73	0.00100	0.0130	3.14	6.28	0.50	7
159	24	NA	20	1197.73	1197.00	NA	0.0130	3.14	6.28	0.50	#VALUE!

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
160	30	NA	329	1197.00	1196.60	0.00100	0.0130	4.91	7.85	0.63	13
161	30	NA	265	1196.60	1196.45	0.00100	0.0130	4.91	7.85	0.63	13
162	30	NA	271	1196.45	1196.18	0.00100	0.0130	4.91	7.85	0.63	13
163	30	NA	40	1196.08	1196.04	0.00100	0.0130	4.91	7.85	0.63	13
165	30	NA	83	1247.79	1247.51	0.00434	0.0130	4.91	7.85	0.63	27
166	24	NA	10	1248.85	1248.81	0.00300	0.0130	3.14	6.28	0.50	12
167	24	NA	124	1248.71	1248.42	0.00234	0.0130	3.14	6.28	0.50	11
168	24	NA	295	1248.32	1247.67	0.00223	0.0130	3.14	6.28	0.50	11
169	24	NA	345	1249.42	1248.19	0.00406	0.0130	3.14	6.28	0.50	14
170	24	NA	305	1248.19	1246.71	0.00485	0.0130	3.14	6.28	0.50	16
171	24	NA	330	1246.73	1245.10	0.00300	0.0130	3.14	6.28	0.50	12
172	30	NA	10	1244.60	1244.60	0.00300	0.0130	4.91	7.85	0.63	23
173	42	RGRCP	7	1237.91	1237.90	0.00360	0.0130	9.62	11.00	0.88	61
180	24	RGRCP	156	1229.05	1226.30	0.01770	0.0130	3.14	6.28	0.50	30
186	33	RCP	282	1227.71	1226.33	0.00488	0.0130	5.94	8.64	0.69	37
187	33	RCP	80	1226.33	1225.94	0.00488	0.0130	5.94	8.64	0.69	37
188	30	NA	300	1210.82	1209.96	0.00240	0.0130	4.91	7.85	0.63	20
189	24	NA	290	1212.15	1211.20	0.00300	0.0130	3.14	6.28	0.50	12
190	24	NA	210	1213.20	1212.15	0.00500	0.0130	3.14	6.28	0.50	16
191	24	NA	300	1214.70	1213.20	0.00500	0.0130	3.14	6.28	0.50	16
192	24	NA	250	1215.52	1214.70	0.00320	0.0130	3.14	6.28	0.50	13
193	24	NA	260	1215.96	1215.52	0.00190	0.0130	3.14	6.28	0.50	10
194	30	NA	105	1221.95	1221.52	0.00400	0.0130	4.91	7.85	0.63	26
195	24	NA	92	1224.74	1221.95	0.01070	0.0130	3.14	6.28	0.50	23
196	24	NA	279	1225.16	1223.75	0.00540	0.0130	3.14	6.28	0.50	17
197	24	NA	252	1225.43	1225.16	0.00100	0.0130	3.14	6.28	0.50	7
207	24	RGRCP	62	1205.81	1205.75	0.00100	0.0130	3.14	6.28	0.50	7
234	24	RGRCP	322	1204.48	1203.84	0.00200	0.0130	3.14	6.28	0.50	10
235	48	RGRCP	90	1202.09	1201.55	0.00600	0.0130	12.57	12.57	1.00	112
236	48	RGRCP	127	1202.31	1201.55	0.00600	0.0130	12.57	12.57	1.00	112
237	36	RGRCP	230	1204.71	1203.84	0.00400	0.0130	7.07	9.42	0.75	42
238	78	RGRCP	227	1200.28	1199.34	0.00420	0.0130	33.18	20.42	1.63	341
239	78	RGRCP	613	1199.34	1197.99	0.00220	0.0130	33.18	20.42	1.63	247
240	78	RGRCP	557	1197.99	1196.76	0.00220	0.0130	33.18	20.42	1.63	247
241	78	RGRCP	553	1196.76	1195.54	0.00220	0.0130	33.18	20.42	1.63	247
242	78	RGRCP	512	1195.54	1194.41	0.00220	0.0130	33.18	20.42	1.63	247
322	30	RGRCP	97	1243.59	1243.08	0.00400	0.0130	4.91	7.85	0.63	26
324	30	RGRCP	146	1247.26	1246.38	0.00600	0.0130	4.91	7.85	0.63	32
325	30	RGRCP	394	1246.38	1243.11	0.00830	0.0130	4.91	7.85	0.63	37
326	30	RGRCP	247	1243.11	1241.53	0.00600	0.0130	4.91	7.85	0.63	32
327	30	RGRCP	352	1250.25	1247.10	0.00810	0.0130	4.91	7.85	0.63	37
328	30	RGRCP	400	1247.10	1245.10	0.00500	0.0130	4.91	7.85	0.63	29
329	30	RGRCP	387	1245.10	1243.14	0.00350	0.0130	4.91	7.85	0.63	24
330	30	RGRCP	220	1243.14	1243.31	0.00350	0.0130	4.91	7.85	0.63	24
331	30	RGRCP	383	1243.31	1241.63	0.00350	0.0130	4.91	7.85	0.63	24
332	36	RGRCP	245	1241.53	1240.30	0.00240	0.0130	7.07	9.42	0.75	33
333	36	RGRCP	606	1240.30	1238.24	0.00340	0.0130	7.07	9.42	0.75	39
334	36	RGRCP	205	1238.24	1237.54	0.00340	0.0130	7.07	9.42	0.75	39
335	36	RGRCP	213	1237.54	1236.82	0.00340	0.0130	7.07	9.42	0.75	39
336	36	RGRCP	99	1236.82	1234.44	0.02410	0.0130	7.07	9.42	0.75	104
337	30	NA	99	1247.51	1247.26	0.00600	0.0130	4.91	7.85	0.63	32
338	24	RGRCP	44	1245.58	1243.76	0.03810	0.0130	3.14	6.28	0.50	44
339	24	RGRCP	70	1243.76	1238.05	0.08620	0.0130	3.14	6.28	0.50	67
340	42	RGRCP	545	1237.23	1235.11	0.00400	0.0130	9.62	11.00	0.88	64
341	42	RGRCP	476	1235.11	1233.48	0.00344	0.0130	9.62	11.00	0.88	59
342	36	RGRCP	27	1234.44	1233.20	0.20380	0.0130	7.07	9.42	0.75	302
343	54	RGRCP	544	1232.48	1230.86	0.00298	0.0130	15.90	14.14	1.13	108
344	42	RGRCP	190	1237.90	1237.23	0.00360	0.0130	9.62	11.00	0.88	61
345	36	NA	410	1216.80	1216.04	0.00230	0.0130	7.07	9.42	0.75	32
346	36	NA	447	1216.04	1214.83	0.00230	0.0130	7.07	9.42	0.75	32
347	36	NA	617	1214.83	1213.55	0.00230	0.0130	7.07	9.42	0.75	32
348	24	NA	48	1226.22	1221.68	NA	0.0130	3.14	6.28	0.50	#VALUE!
349	24	NA	66	1221.68	1221.75	NA	0.0130	3.14	6.28	0.50	#VALUE!
350	36	NA	47	1223.67	1211.74	NA	0.0130	7.07	9.42	0.75	#VALUE!
351	42	NA	651	1213.55	1211.04	0.00230	0.0130	9.62	11.00	0.88	48

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
352	54	NA	40	1211.22	1210.67	0.01380	0.0130	15.90	14.14	1.13	232
353	36	NA	559	1222.50	1212.15	0.01852	0.0130	7.07	9.42	0.75	91
354	36	RGRCP	322	1223.11	1221.21	0.00200	0.0130	7.07	9.42	0.75	30
355	24	NA	310	1199.34	1198.00	0.00470	0.0130	3.14	6.28	0.50	16
356	24	NA	315	1201.24	1199.34	0.00520	0.0130	3.14	6.28	0.50	16
357	24	NA	295	1203.38	1201.24	0.00790	0.0130	3.14	6.28	0.50	20
358	24	NA	189	1204.80	1203.38	0.00790	0.0130	3.14	6.28	0.50	20
359	24	NA	88	1205.40	1204.80	0.00570	0.0130	3.14	6.28	0.50	17
360	24	NA	91	1205.42	1204.80	0.00550	0.0130	3.14	6.28	0.50	17
361	36	NA	95	1209.03	1208.65	0.00200	0.0130	7.07	9.42	0.75	30
362	36	NA	133	1209.46	1209.03	0.00200	0.0130	7.07	9.42	0.75	30
363	84	NA	314	1179.65	1179.55	0.00040	0.0130	38.48	21.99	1.75	128
364	84	NA	616	1179.98	1179.65	0.00040	0.0130	38.48	21.99	1.75	128
365	84	NA	456	1180.26	1179.98	0.00070	0.0130	38.48	21.99	1.75	169
367	36	NA	153	1190.30	1180.56	0.06230	0.0130	7.07	9.42	0.75	167
368	30	NA	200	1191.16	1180.56	0.05140	0.0130	4.91	7.85	0.63	93
370	24	RGRCP	230	1192.47	1191.30	0.00510	0.0130	3.14	6.28	0.50	16
372	24	NA	285	1192.63	1191.66	0.00360	0.0130	3.14	6.28	0.50	14
373	24	NA	280	1193.52	1192.63	0.00360	0.0130	3.14	6.28	0.50	14
374	24	NA	210	1198.00	1196.90	0.00520	0.0130	3.14	6.28	0.50	16
375	78	NA	432	1193.20	1191.87	0.00220	0.0130	33.18	20.42	1.63	247
376	78	NA	440	1193.97	1193.20	0.00220	0.0130	33.18	20.42	1.63	247
377	78	NA	178	1194.43	1193.97	0.00260	0.0130	33.18	20.42	1.63	268
378	54	RGRCP	671	1230.86	1226.21	0.00692	0.0130	15.90	14.14	1.13	164
379	54	RGRCP	640	1225.99	1223.65	0.00340	0.0130	15.90	14.14	1.13	115
380	54	RGRCP	598	1223.65	1221.91	0.00340	0.0130	15.90	14.14	1.13	115
381	36	RGRCP	10	1222.80	1222.75	0.00245	0.0130	7.07	9.42	0.75	33
382	36	RGRCP	100	1222.75	1222.52	0.00245	0.0130	7.07	9.42	0.75	33
383	54	RGRCP	642	1221.91	1219.64	0.00340	0.0130	15.90	14.14	1.13	115
384	54	RGRCP	660	1219.64	1216.62	0.00469	0.0130	15.90	14.14	1.13	135
385	54	RGRCP	31	1216.62	1216.48	0.00469	0.0130	15.90	14.14	1.13	135
386	36	CMP	13	1214.70	1213.79	0.05380	0.0280	7.07	9.42	0.75	72
387	36	CMP	292	1213.79	1213.03	0.00260	0.0280	7.07	9.42	0.75	16
388	36	CMP	480	1213.03	1211.79	0.00260	0.0280	7.07	9.42	0.75	16
389	36	CMP	272	1211.79	1211.08	0.00260	0.0280	7.07	9.42	0.75	16
390	42	RGRCP	40	1210.58	1210.00	0.00260	0.0130	9.62	11.00	0.88	51
391	24	NA	22	1218.70	1217.73	0.04600	0.0130	3.14	6.28	0.50	49
392	24	NA	48	1221.70	1212.01	NA	0.0130	3.14	6.28	0.50	#VALUE!
393	60	NA	660	1210.14	1207.72	0.00340	0.0130	19.64	15.71	1.25	152
394	60	NA	649	1203.36	1199.04	0.00490	0.0130	19.64	15.71	1.25	183
395	42	NA	31	1215.00	1200.77	NA	0.0130	9.62	11.00	0.88	#VALUE!
396	66	NA	85	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
397	66	NA	7	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
398	24	RGRCP	18	1226.44	1224.68	0.09780	0.0130	3.14	6.28	0.50	71
399	24	RGRCP	38	1224.88	1224.17	0.02000	0.0130	3.14	6.28	0.50	32
400	24	NA	4	1225.00	1224.80	0.05000	0.0130	3.14	6.28	0.50	51
401	36	NA	414	1223.80	1222.50	0.00314	0.0130	7.07	9.42	0.75	37
404	60	NA	713	1207.72	1205.32	0.00340	0.0130	19.64	15.71	1.25	152
405	60	NA	607	1205.32	1203.36	0.00340	0.0130	19.64	15.71	1.25	152
408	96	NA	823	1179.55	1179.21	0.00040	0.0130	50.27	25.13	2.00	183
409	54	RGRCP	8	1217.04	1216.85	0.02380	0.0130	15.90	14.14	1.13	304
410	54	RGRCP	63	1216.85	1215.47	0.02210	0.0130	15.90	14.14	1.13	293
411	78	RGRCP	607	1214.48	1212.80	0.00269	0.0130	33.18	20.42	1.63	273
412	78	RGRCP	650	1212.80	1211.07	0.00269	0.0130	33.18	20.42	1.63	273
413	78	RGRCP	650	1211.07	1209.28	0.00269	0.0130	33.18	20.42	1.63	273
414	78	RGRCP	608	1209.28	1206.77	0.00424	0.0130	33.18	20.42	1.63	342
415	54	NA	28	1208.17	1208.05	0.00400	0.0130	15.90	14.14	1.13	125
416	54	NA	61	1208.05	1207.81	0.00400	0.0130	15.90	14.14	1.13	125
417	60	RGRCP	10	1206.77	1206.48	0.02680	0.0130	19.64	15.71	1.25	428
429	84	NA	656	1197.96	1192.00	0.00900	0.0130	38.48	21.99	1.75	608
434	84	NA	247	0.00	0.00	NA	0.0130	38.48	21.99	1.75	#VALUE!
435	84	NA	255	1192.00	1191.44	0.00220	0.0130	38.48	21.99	1.75	300
438	27	NA	23	1220.25	1212.60	NA	0.0130	3.98	7.07	0.56	#VALUE!
439	30	NA	31	1217.08	1212.60	NA	0.0130	4.91	7.85	0.63	#VALUE!
440	24	NA	23	1220.06	1212.12	NA	0.0130	3.14	6.28	0.50	#VALUE!

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
441	24	NA	31	1217.82	1212.32	NA	0.0130	3.14	6.28	0.50	#VALUE!
442	60	RGRCP	645	1203.11	1201.36	0.00268	0.0130	19.64	15.71	1.25	135
443	60	RGRCP	645	1201.36	1199.58	0.00268	0.0130	19.64	15.71	1.25	135
444	60	RGRCP	20	1199.58	1199.06	0.03000	0.0130	19.64	15.71	1.25	452
445	24	RGRCP	80	1216.05	1207.76	0.10290	0.0130	3.14	6.28	0.50	73
446	60	RGRCP	650	1206.48	1204.82	0.00268	0.0130	19.64	15.71	1.25	135
447	60	RGRCP	650	1204.82	1203.11	0.00268	0.0130	19.64	15.71	1.25	135
448	96	NA	187	0.00	0.00	NA	0.0130	50.27	25.13	2.00	#VALUE!
462	36	RGRCP	520	1214.78	1213.16	0.00320	0.0130	7.07	9.42	0.75	38
463	42	RGRCP	508	1212.66	1210.73	0.00360	0.0130	9.62	11.00	0.88	61
464	42	RGRCP	476	1210.73	1209.08	0.00360	0.0130	9.62	11.00	0.88	61
465	30	RGRCP	412	1217.07	1215.28	0.00360	0.0130	4.91	7.85	0.63	25
467	48	RGRCP	211	1212.60	1208.00	NA	0.0130	12.57	12.57	1.00	#VALUE!
469	60	RGRCP	21	1207.50	1207.52	0.00280	0.0130	19.64	15.71	1.25	138
470	60	RGRCP	737	1207.52	1205.49	0.00280	0.0130	19.64	15.71	1.25	138
471	60	RGRCP	657	1205.49	1203.51	0.00280	0.0130	19.64	15.71	1.25	138
472	60	RGRCP	590	1203.51	1201.92	0.00280	0.0130	19.64	15.71	1.25	138
473	66	RGRCP	9	1201.38	1201.37	0.00280	0.0130	23.76	17.28	1.38	178
474	66	RGRCP	615	1201.37	1199.66	0.00280	0.0130	23.76	17.28	1.38	178
475	60	RGRCP	141	1199.06	1198.61	0.00320	0.0130	19.64	15.71	1.25	148
476	96	RGRCP	29	1197.11	1196.87	0.00400	0.0130	50.27	25.13	2.00	578
477	96	RGRCP	620	1196.87	1194.54	0.00400	0.0130	50.27	25.13	2.00	578
486	24	RGRCP	30	1205.50	1204.00	0.05000	0.0130	3.14	6.28	0.50	51
489	27	NA	19	0.00	0.00	NA	0.0130	3.98	7.07	0.56	#VALUE!
491	24	NA	400	1204.33	1203.50	0.00208	0.0130	3.14	6.28	0.50	10
492	24	NA	365	1203.50	1202.73	0.00211	0.0130	3.14	6.28	0.50	10
493	24	NA	28	1203.95	1203.53	0.01380	0.0130	3.14	6.28	0.50	27
494	24	NA	30	1203.53	1200.03	0.11670	0.0130	3.14	6.28	0.50	77
495	24	NA	565	1202.73	1199.87	0.00506	0.0130	3.14	6.28	0.50	16
496	27	NA	600	1199.62	1196.63	0.00498	0.0130	3.98	7.07	0.56	22
497	27	NA	310	1196.63	1195.08	0.00500	0.0130	3.98	7.07	0.56	22
498	27	NA	51	1198.09	1197.13	0.01890	0.0130	3.98	7.07	0.56	43
499	27	NA	12	1197.13	1195.08	0.14640	0.0130	3.98	7.07	0.56	119
500	27	NA	91	1195.08	1194.63	0.00495	0.0130	3.98	7.07	0.56	22
506	24	NA	400	1204.02	1203.22	0.00200	0.0130	3.14	6.28	0.50	10
507	24	NA	400	1203.22	1202.42	0.00200	0.0130	3.14	6.28	0.50	10
508	30	NA	79	1196.60	1196.32	0.00354	0.0130	4.91	7.85	0.63	24
509	24	NA	238	1193.50	1191.30	0.00900	0.0130	3.14	6.28	0.50	22
510	30	NA	44	1191.68	1191.30	0.00630	0.0130	4.91	7.85	0.63	33
511	30	NA	618	1191.30	1187.50	0.00533	0.0130	4.91	7.85	0.63	30
512	36	NA	650	1187.50	1180.53	0.01073	0.0130	7.07	9.42	0.75	69
513	30	NA	663	1194.50	1193.16	0.00200	0.0130	4.91	7.85	0.63	18
514	30	NA	693	1193.16	1191.68	0.00200	0.0130	4.91	7.85	0.63	18
515	24	NA	390	1202.42	1201.64	0.00200	0.0130	3.14	6.28	0.50	10
516	27	NA	400	1201.39	1200.35	0.00260	0.0130	3.98	7.07	0.56	16
517	27	NA	400	1200.35	1199.31	0.00260	0.0130	3.98	7.07	0.56	16
518	30	NA	400	1199.06	1198.26	0.00200	0.0130	4.91	7.85	0.63	18
519	30	NA	400	1198.26	1197.46	0.00200	0.0130	4.91	7.85	0.63	18
520	30	NA	318	1197.46	1196.82	0.00201	0.0130	4.91	7.85	0.63	18
521	30	NA	62	1196.82	1196.60	0.00354	0.0130	4.91	7.85	0.63	24
522	24	NA	29	1194.94	1192.80	0.06900	0.0130	3.14	6.28	0.50	60
523	27	NA	41	1181.10	1175.40	0.09390	0.0130	3.98	7.07	0.56	95
524	36	NA	334	1177.30	1175.40	0.00400	0.0130	7.07	9.42	0.75	42
525	48	NA	195	1175.40	1175.01	0.00200	0.0130	12.57	12.57	1.00	64
526	60	NA	595	1174.60	1172.53	0.00380	0.0130	19.64	15.71	1.25	161
527	60	NA	659	1172.53	1170.02	0.00380	0.0130	19.64	15.71	1.25	161
528	42	NA	58	1178.81	1178.51	0.00510	0.0130	9.62	11.00	0.88	72
529	42	NA	60	1179.12	1178.81	0.00500	0.0130	9.62	11.00	0.88	71
530	36	NA	87	1180.53	0.00	0.01073	0.0130	7.07	9.42	0.75	69
531	54	NA	550	0.00	1176.36	0.00300	0.0130	15.90	14.14	1.13	108
532	54	NA	667	1176.36	1174.60	0.00300	0.0130	15.90	14.14	1.13	108
533	24	RGRCP	5	1179.40	1179.38	0.00250	0.0130	3.14	6.28	0.50	11
534	36	RGRCP	316	1179.38	1177.89	0.00250	0.0130	7.07	9.42	0.75	33
535	36	RGRCP	419	1177.89	1177.30	0.00250	0.0130	7.07	9.42	0.75	33
536	60	RGRCP	55	1153.35	1153.08	0.00385	0.0130	19.64	15.71	1.25	162

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
537	36	NA	645	1189.94	1186.80	0.00320	0.0130	7.07	9.42	0.75	38
538	36	NA	679	1192.02	1189.94	0.00320	0.0130	7.07	9.42	0.75	38
539	24	NA	48	1192.80	1192.02	0.00580	0.0130	3.14	6.28	0.50	17
540	60	NA	27	1165.60	1165.35	NA	0.0130	19.64	15.71	1.25	#VALUE!
541	78	NA	627	1166.87	1165.60	0.00170	0.0130	33.18	20.42	1.63	217
542	48	NA	660	1173.89	1169.83	0.00600	0.0130	12.57	12.57	1.00	112
543	48	NA	224	1174.60	1173.89	0.00250	0.0130	12.57	12.57	1.00	72
544	48	NA	373	1177.62	1174.60	0.00800	0.0130	12.57	12.57	1.00	129
545	48	NA	547	1181.07	1177.62	0.00620	0.0130	12.57	12.57	1.00	113
546	48	NA	650	1183.57	1181.07	0.00400	0.0130	12.57	12.57	1.00	91
547	36	NA	99	1184.37	1183.57	0.00300	0.0130	7.07	9.42	0.75	37
548	48	NA	58	1186.80	1183.57	0.03830	0.0130	12.57	12.57	1.00	282
549	48	NA	130	1169.83	1169.29	0.00600	0.0130	12.57	12.57	1.00	112
550	60	RGRCP	47	0.00	0.00	NA	0.0130	19.64	15.71	1.25	#VALUE!
551	60	RGRCP	707	0.00	0.00	0.00380	0.0130	19.64	15.71	1.25	161
552	60	RGRCP	606	0.00	0.00	0.00380	0.0130	19.64	15.71	1.25	161
554	30	PVC	300	1169.50	1168.20	0.00400	0.0100	4.91	7.85	0.63	34
555	30	PVC	193	1168.20	1166.55	0.00400	0.0100	4.91	7.85	0.63	34
556	30	NA	40	1166.55	1161.78	0.11900	0.0130	4.91	7.85	0.63	142
557	36	NA	457	1160.15	1158.73	0.00260	0.0130	7.07	9.42	0.75	34
558	36	NA	410	1158.73	1157.84	0.00260	0.0130	7.07	9.42	0.75	34
559	36	NA	393	1157.84	1154.31	0.00837	0.0130	7.07	9.42	0.75	61
560	78	NA	602	1168.07	1166.87	0.00200	0.0130	33.18	20.42	1.63	235
561	60	NA	119	1170.02	1168.07	0.00380	0.0130	19.64	15.71	1.25	161
565	30	RGRCP	41	1159.10	1153.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
566	30	RGRCP	34	1159.32	1159.10	0.00500	0.0130	4.91	7.85	0.63	29
567	24	RGRCP	18	1160.14	1159.32	0.01770	0.0130	3.14	6.28	0.50	30
568	24	RGRCP	235	0.00	1159.32	0.00357	0.0130	3.14	6.28	0.50	14
569	24	RGRCP	21	1156.84	1153.87	0.00500	0.0130	3.14	6.28	0.50	16
570	24	NA	16	1153.87	1155.94	0.21870	0.0130	3.14	6.28	0.50	106
571	24	NA	10	1155.94	1149.80	0.43600	0.0130	3.14	6.28	0.50	150
572	30	RGRCP	7	1155.39	1155.19	0.01360	0.0130	4.91	7.85	0.63	48
573	24	NA	27	1149.80	1142.62	0.18600	0.0130	3.14	6.28	0.50	98
574	60	RGRCP	634	1145.37	1143.12	0.00385	0.0130	19.64	15.71	1.25	162
575	60	RGRCP	662	1148.12	1145.37	0.00385	0.0130	19.64	15.71	1.25	162
576	60	RGRCP	644	1150.38	1148.12	0.00385	0.0130	19.64	15.71	1.25	162
577	60	RGRCP	685	1153.08	1150.38	0.00385	0.0130	19.64	15.71	1.25	162
578	30	RGRCP	92	1155.19	1154.20	0.01360	0.0130	4.91	7.85	0.63	48
579	36	RGRCP	6	1184.30	1184.25	0.00400	0.0130	7.07	9.42	0.75	42
580	36	RGRCP	37	1184.25	1184.01	0.00710	0.0130	7.07	9.42	0.75	56
581	24	RGRCP	6	1181.49	1181.47	0.00400	0.0130	3.14	6.28	0.50	14
582	66	NA	12	1167.46	1167.30	0.01312	0.0130	23.76	17.28	1.38	386
583	48	NA	10	1160.56	1160.52	0.00500	0.0130	12.57	12.57	1.00	102
584	36	NA	9	1171.69	1171.60	0.00950	0.0130	7.07	9.42	0.75	65
585	36	NA	44	1171.60	1171.18	0.00950	0.0130	7.07	9.42	0.75	65
586	36	NA	9	1167.62	1167.59	0.00300	0.0130	7.07	9.42	0.75	37
587	24	NA	9	1161.85	1161.70	0.01670	0.0130	3.14	6.28	0.50	29
588	36	NA	9	1160.57	1159.96	0.06800	0.0130	7.07	9.42	0.75	174
589	42	NA	688	1154.10	1152.12	0.00255	0.0130	9.62	11.00	0.88	51
590	42	NA	713	1152.12	1150.40	0.00255	0.0130	9.62	11.00	0.88	51
591	42	NA	592	1150.40	1148.94	0.00255	0.0130	9.62	11.00	0.88	51
592	42	NA	600	1148.94	1147.42	0.00255	0.0130	9.62	11.00	0.88	51
593	42	NA	36	1149.30	1146.94	NA	0.0130	9.62	11.00	0.88	#VALUE!
594	24	NA	10	1145.92	1144.58	0.40670	0.0130	3.14	6.28	0.50	145
595	36	RGRCP	10	1146.04	1145.94	0.00950	0.0130	7.07	9.42	0.75	65
596	36	RGRCP	163	1145.94	1144.30	0.00950	0.0130	7.07	9.42	0.75	65
597	24	RGRCP	16	1150.17	1150.03	0.02140	0.0130	3.14	6.28	0.50	33
598	24	RGRCP	161	1150.03	1148.03	0.02140	0.0130	3.14	6.28	0.50	33
599	36	RGRCP	62	1144.30	1139.47	0.07760	0.0130	7.07	9.42	0.75	186
600	24	RGRCP	70	1148.03	1142.82	0.06000	0.0130	3.14	6.28	0.50	56
601	24	NA	27	1144.58	1138.38	0.20000	0.0130	3.14	6.28	0.50	101
602	72	RGRCP	346	1136.00	1134.94	0.00272	0.0130	28.27	18.85	1.50	221
603	72	RGRCP	642	1137.82	1136.00	0.00272	0.0130	28.27	18.85	1.50	221
604	66	RGRCP	609	1140.00	1138.12	0.00270	0.0130	23.76	17.28	1.38	175
605	66	RGRCP	392	1140.79	1140.00	0.00270	0.0130	23.76	17.28	1.38	175

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
606	66	RGRCP	624	1142.62	1140.79	0.00270	0.0130	23.76	17.28	1.38	175
607	102	NA	1271	0.00	0.00	NA	0.0130	56.75	26.70	2.13	#VALUE!
608	60	RGRCP	465	1183.37	1181.51	0.00400	0.0130	19.64	15.71	1.25	165
609	60	RGRCP	15	1183.43	1183.37	0.00400	0.0130	19.64	15.71	1.25	165
610	36	RGRCP	32	1184.01	1183.83	0.00550	0.0130	7.07	9.42	0.75	50
611	60	RGRCP	520	1181.51	1179.43	0.00400	0.0130	19.64	15.71	1.25	165
612	24	RGRCP	58	1181.41	1179.25	0.03790	0.0130	3.14	6.28	0.50	44
613	60	RGRCP	660	1179.43	1176.79	0.00400	0.0130	19.64	15.71	1.25	165
614	60	RGRCP	642	1176.79	1174.22	0.00400	0.0130	19.64	15.71	1.25	165
615	24	RCP	27	1183.34	1174.12	0.24810	0.0130	3.14	6.28	0.50	113
616	24	RCP	35	1183.21	1174.12	0.18970	0.0130	3.14	6.28	0.50	99
617	60	RGRCP	15	1174.22	1174.12	0.00500	0.0130	19.64	15.71	1.25	185
618	60	RGRCP	268	1174.12	1173.04	0.00500	0.0130	19.64	15.71	1.25	185
619	60	NA	15	1173.04	1173.00	0.00290	0.0130	19.64	15.71	1.25	141
620	60	NA	155	1173.00	1167.25	0.03700	0.0130	19.64	15.71	1.25	502
621	66	NA	163	1167.30	1166.77	0.00290	0.0130	23.76	17.28	1.38	181
622	24	RGRCP	43	1182.97	1169.41	0.32820	0.0130	3.14	6.28	0.50	130
623	60	NA	66	1167.25	1167.06	0.00290	0.0130	19.64	15.71	1.25	141
624	78	NA	123	1166.29	1165.92	0.00320	0.0130	33.18	20.42	1.63	297
625	78	NA	606	1165.92	1164.00	0.00320	0.0130	33.18	20.42	1.63	297
626	78	NA	514	1164.00	1162.34	0.00320	0.0130	33.18	20.42	1.63	297
627	36	NA	47	1171.18	1164.29	0.14640	0.0130	7.07	9.42	0.75	256
628	78	NA	521	1162.34	1160.24	0.00400	0.0130	33.18	20.42	1.63	332
629	78	NA	444	1160.24	1158.46	0.00400	0.0130	33.18	20.42	1.63	332
630	36	NA	70	1167.59	1160.60	0.10000	0.0130	7.07	9.42	0.75	211
631	78	NA	291	1158.46	1157.30	0.00400	0.0130	33.18	20.42	1.63	332
632	84	NA	774	1157.30	1155.02	0.00290	0.0130	38.48	21.99	1.75	345
633	84	NA	614	1151.73	1150.20	0.00254	0.0130	38.48	21.99	1.75	323
634	84	NA	140	1150.20	1149.89	0.00220	0.0130	38.48	21.99	1.75	300
635	48	NA	155	1160.50	1158.47	0.01340	0.0130	12.57	12.57	1.00	167
636	84	NA	332	1155.02	1154.05	0.00290	0.0130	38.48	21.99	1.75	345
637	24	NA	69	1161.70	1156.77	0.07100	0.0130	3.14	6.28	0.50	60
638	84	NA	285	1154.05	1153.16	0.00290	0.0130	38.48	21.99	1.75	345
639	36	NA	65	1159.96	1155.51	0.06800	0.0130	7.07	9.42	0.75	174
640	84	NA	616	1153.16	1151.73	0.00254	0.0130	38.48	21.99	1.75	323
641	90	NA	590	1142.43	1140.50	0.00380	0.0130	44.18	23.56	1.88	475
642	24	NA	21	1154.00	1148.92	0.24490	0.0130	3.14	6.28	0.50	112
643	24	NA	8	1160.57	1154.00	0.01000	0.0130	3.14	6.28	0.50	23
644	90	NA	745	1145.45	1142.43	0.00380	0.0130	44.18	23.56	1.88	475
645	90	NA	568	1147.34	1145.45	0.00380	0.0130	44.18	23.56	1.88	475
646	90	NA	615	1149.89	1147.34	0.00380	0.0130	44.18	23.56	1.88	475
647	54	NA	405	1154.44	1151.37	0.00800	0.0130	15.90	14.14	1.13	176
648	42	NA	72	1146.94	1142.51	NA	0.0130	9.62	11.00	0.88	#VALUE!
649	96	NA	421	1133.60	1132.40	0.00330	0.0130	50.27	25.13	2.00	525
650	96	NA	661	1135.73	1133.60	0.00330	0.0130	50.27	25.13	2.00	525
651	90	NA	220	1136.14	1135.73	0.00330	0.0130	44.18	23.56	1.88	442
652	90	NA	446	1137.74	1136.14	0.00330	0.0130	44.18	23.56	1.88	442
653	90	NA	381	1139.11	1137.74	0.00330	0.0130	44.18	23.56	1.88	442
654	90	NA	325	1140.50	1139.11	0.00330	0.0130	44.18	23.56	1.88	442
655	102	NA	1476	0.00	0.00	NA	0.0130	56.75	26.70	2.13	#VALUE!
656	72	NA	116	0.00	0.00	0.02430	0.0130	28.27	18.85	1.50	662
657	96	NA	169	0.00	0.00	0.00310	0.0130	50.27	25.13	2.00	509
658	54	NA	268	1134.97	1134.57	0.00150	0.0130	15.90	14.14	1.13	76
659	60	NA	67	1134.57	1134.49	0.00100	0.0130	19.64	15.71	1.25	83
660	60	NA	530	1134.49	1133.90	0.00100	0.0130	19.64	15.71	1.25	83
661	60	NA	531	1133.90	1129.73	0.00790	0.0130	19.64	15.71	1.25	232
662	24	NA	40	1138.28	1136.31	0.05020	0.0130	3.14	6.28	0.50	51
663	24	NA	14	1103.24	1094.94	0.41420	0.0130	3.14	6.28	0.50	146
664	66	RGRCP	1128	1097.46	1097.75	0.00190	0.0130	23.76	17.28	1.38	147
665	24	NA	17	1101.92	1095.60	0.41420	0.0130	3.14	6.28	0.50	146
666	66	RGRCP	1322	1097.75	1092.33	0.00190	0.0130	23.76	17.28	1.38	147
667	24	NA	30	1092.56	1092.33	0.00360	0.0130	3.14	6.28	0.50	14
668	42	RGRCP	64	1092.56	1092.33	0.00360	0.0130	9.62	11.00	0.88	61
669	30	NA	37	1101.16	1093.27	0.21300	0.0130	4.91	7.85	0.63	190
670	42	RCP	782	1143.35	1141.95	0.00178	0.0130	9.62	11.00	0.88	43

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
671	30	RCP	124	1146.90	1146.61	0.00234	0.0130	4.91	7.85	0.63	20
672	33	RCP	317	1146.36	1145.37	0.00234	0.0130	5.94	8.64	0.69	26
673	33	RCP	17	0.00	0.00	0.00234	0.0130	5.94	8.64	0.69	26
674	36	RCP	300	1145.37	1144.31	0.00234	0.0130	7.07	9.42	0.75	32
675	39	RCP	364	1144.31	1143.35	0.00234	0.0130	8.30	10.21	0.81	40
676	42	RCP	366	1141.95	1141.29	0.00178	0.0130	9.62	11.00	0.88	43
677	43	HERCP	660	1138.45	1136.42	0.00308	0.0130	10.08	11.26	0.90	60
678	43	HERCP	660	1139.11	1138.45	0.00100	0.0130	10.08	11.26	0.90	34
679	42	NA	560	1130.68	1129.40	0.00220	0.0130	9.62	11.00	0.88	47
680	42	NA	544	1132.00	1130.68	0.00220	0.0130	9.62	11.00	0.88	47
681	108	NA	53	1132.27	1132.00	0.00500	0.0130	63.62	28.27	2.25	885
682	60	NA	7436	1123.70	1129.40	0.00400	0.0130	19.64	15.71	1.25	165
683	54	NA	50	1129.40	1132.20	0.00400	0.0130	15.90	14.14	1.13	125
684	42	NA	153	1129.40	1127.88	0.00280	0.0130	9.62	11.00	0.88	53
685	42	NA	500	1127.88	1126.47	0.00280	0.0130	9.62	11.00	0.88	53
686	42	NA	95	1126.47	1126.20	0.00280	0.0130	9.62	11.00	0.88	53
687	72	NA	53	1126.20	1126.00	0.00380	0.0130	28.27	18.85	1.50	262
688	60	NA	218	1126.00	1125.50	0.00230	0.0130	19.64	15.71	1.25	125
689	60	NA	564	1125.50	1124.00	0.00250	0.0130	19.64	15.71	1.25	131
690	60	NA	346	1124.00	1121.58	0.00380	0.0130	19.64	15.71	1.25	161
691	30	NA	6	1130.36	1129.20	0.19330	0.0130	4.91	7.85	0.63	181
692	24	NA	18	1129.54	1119.99	0.22210	0.0130	3.14	6.28	0.50	107
693	24	NA	9	1123.85	1129.54	0.76680	0.0130	3.14	6.28	0.50	199
694	24	NA	5	1130.50	1123.85	0.21380	0.0130	3.14	6.28	0.50	105
695	108	NA	53	1133.10	1133.00	0.00190	0.0130	63.62	28.27	2.25	546
696	30	NA	20	1123.89	1116.13	0.41410	0.0130	4.91	7.85	0.63	265
697	24	NA	25	1123.26	1119.29	0.12810	0.0130	3.14	6.28	0.50	81
698	24	NA	21	1123.40	1123.26	0.00660	0.0130	3.14	6.28	0.50	18
699	24	NA	15	1123.23	1117.71	0.41380	0.0130	3.14	6.28	0.50	146
700	30	NA	56	1119.28	1114.98	0.07700	0.0130	4.91	7.85	0.63	114
701	66	NA	25	1123.50	1113.00	0.53770	0.0130	23.76	17.28	1.38	2469
702	42	NA	244	1111.39	1109.77	0.00420	0.0130	9.62	11.00	0.88	65
703	42	NA	380	1113.00	1111.39	0.00420	0.0130	9.62	11.00	0.88	65
704	42	NA	356	1109.77	1109.53	0.00420	0.0130	9.62	11.00	0.88	65
705	42	NA	186	1108.26	1107.85	0.00220	0.0130	9.62	11.00	0.88	47
706	42	NA	285	1107.85	1107.27	0.00190	0.0130	9.62	11.00	0.88	44
707	48	NA	201	1107.27	1106.20	0.00190	0.0130	12.57	12.57	1.00	63
708	48	NA	355	1106.20	1105.53	0.00190	0.0130	12.57	12.57	1.00	63
709	30	NA	506	1105.53	1104.56	0.00190	0.0130	4.91	7.85	0.63	18
710	30	NA	22	1115.11	1106.93	0.36850	0.0130	4.91	7.85	0.63	250
711	48	NA	393	1104.56	1103.45	0.00190	0.0130	12.57	12.57	1.00	63
712	24	NA	282	1119.01	1118.25	0.00300	0.0130	3.14	6.28	0.50	12
713	24	NA	283	1118.25	1117.40	0.00400	0.0130	3.14	6.28	0.50	14
714	24	NA	78	1117.40	1116.38	0.00400	0.0130	3.14	6.28	0.50	14
715	24	NA	241	1116.38	1115.41	0.00400	0.0130	3.14	6.28	0.50	14
716	30	NA	398	1115.41	1114.02	0.00350	0.0130	4.91	7.85	0.63	24
717	30	NA	402	1114.02	112.61	0.00350	0.0130	4.91	7.85	0.63	24
718	42	NA	53	1105.34	1097.46	0.13230	0.0130	9.62	11.00	0.88	367
719	30	NA	60	1112.61	1104.19	0.14110	0.0130	4.91	7.85	0.63	154
720	48	NA	290	1103.45	0.00	0.00190	0.0130	12.57	12.57	1.00	63
721	60	NA	46	0.00	1102.56	NA	0.0130	19.64	15.71	1.25	#VALUE!
722	48	NA	136	1102.56	1102.54	0.00210	0.0130	12.57	12.57	1.00	66
723	48	NA	146	1102.08	1101.28	0.00210	0.0130	12.57	12.57	1.00	66
724	48	NA	200	1102.54	1102.08	0.00230	0.0130	12.57	12.57	1.00	69
725	30	NA	13	1110.23	1105.19	0.41420	0.0130	4.91	7.85	0.63	265
726	66	RGRCP	655	1098.83	1097.46	0.00210	0.0130	23.76	17.28	1.38	154
727	36	NA	27	0.00	0.00	0.13830	0.0130	7.07	9.42	0.75	249
728	24	RGRCP	13	1091.17	1086.25	0.41000	0.0130	3.14	6.28	0.50	145
729	72	RGRCP	1298	1092.33	1087.69	0.00360	0.0130	28.27	18.85	1.50	255
730	30	NA	24	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
747	36	NA	47	1163.35	1162.15	0.02550	0.0130	7.07	9.42	0.75	107
748	36	NA	50	1163.57	1163.35	0.00500	0.0130	7.07	9.42	0.75	47
749	24	RGRCP	13	1071.13	1066.71	0.36830	0.0130	3.14	6.28	0.50	138
750	30	NA	44	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
751	30	NA	34	1071.70	1070.40	0.01000	0.0130	4.91	7.85	0.63	41

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
752	30	RCP	36	1141.29	1136.09	0.04000	0.0130	4.91	7.85	0.63	82
755	42	RCP	520	1139.98	1139.06	0.00178	0.0130	9.62	11.00	0.88	43
756	42	RCP	707	1141.24	1139.98	0.00178	0.0130	9.62	11.00	0.88	43
757	42	RCP	28	1141.29	1141.24	0.00178	0.0130	9.62	11.00	0.88	43
758	43	HERCP	537	1139.66	1139.11	0.00100	0.0130	10.08	11.26	0.90	34
759	30	RCP	343	1140.00	1139.66	0.00101	0.0130	4.91	7.85	0.63	13
760	24	RCP	382	1140.69	1140.30	0.00100	0.0130	3.14	6.28	0.50	7
761	24	RCP	300	1140.30	1140.00	0.00100	0.0130	3.14	6.28	0.50	7
762	24	RCP	498	1143.19	1141.07	0.00100	0.0130	3.14	6.28	0.50	7
763	24	RCP	487	1143.68	1143.19	0.00100	0.0130	3.14	6.28	0.50	7
764	24	RCP	315	1144.00	1143.68	0.00100	0.0130	3.14	6.28	0.50	7
765	42	RCP	180	0.00	1139.66	NA	0.0130	9.62	11.00	0.88	#VALUE!
766	42	RCP	5	1134.42	0.00	0.01400	0.0130	9.62	11.00	0.88	119
767	60	NA	660	1121.58	1119.00	0.00380	0.0130	19.64	15.71	1.25	161
768	30	NA	17	1129.20	1120.89	0.54490	0.0130	4.91	7.85	0.63	304
769	36	NA	68	1119.20	1119.00	0.00290	0.0130	7.07	9.42	0.75	36
770	66	NA	451	1119.00	1117.24	0.00290	0.0130	23.76	17.28	1.38	181
771	42	NA	75	1119.01	1128.26	0.01000	0.0130	9.62	11.00	0.88	101
772	66	NA	1394	1117.24	1113.00	0.00290	0.0130	23.76	17.28	1.38	181
773	30	NA	32	1116.95	1103.45	0.11990	0.0130	4.91	7.85	0.63	142
774	30	HDPE	8	1116.80	1116.95	0.00270	0.0100	4.91	7.85	0.63	28
775	30	HDPE	9	1109.98	1109.91	0.01110	0.0100	4.91	7.85	0.63	56
776	30	HDPE	6	1111.06	1109.98	0.18680	0.0100	4.91	7.85	0.63	231
777	30	HDPE	5	1111.06	1111.06	0.00000	0.0100	4.91	7.85	0.63	0
778	30	NA	34	1110.10	1110.09	0.00050	0.0130	4.91	7.85	0.63	9
779	30	NA	20	1110.09	1106.44	0.20220	0.0130	4.91	7.85	0.63	185
780	30	NA	10	1106.44	1106.44	0.00000	0.0130	4.91	7.85	0.63	0
781	30	NA	10	1106.44	1106.44	0.00200	0.0130	4.91	7.85	0.63	18
782	24	NA	262	1108.92	1108.12	0.00308	0.0130	3.14	6.28	0.50	13
783	24	NA	468	1108.12	1107.28	0.00308	0.0130	3.14	6.28	0.50	13
784	30	NA	139	1106.72	1106.44	0.00200	0.0130	4.91	7.85	0.63	18
785	30	NA	282	1107.28	1106.72	0.00200	0.0130	4.91	7.85	0.63	18
786	48	NA	493	1101.28	1100.22	0.00210	0.0130	12.57	12.57	1.00	66
787	36	NA	16	1105.44	1100.22	0.18260	0.0130	7.07	9.42	0.75	286
788	60	RGRCP	667	1100.22	1098.83	0.00210	0.0130	19.64	15.71	1.25	120
789	72	RGRCP	192	1083.45	1082.90	0.00350	0.0130	28.27	18.85	1.50	251
790	24	RGRCP	58	1086.25	1085.96	0.00500	0.0130	3.14	6.28	0.50	16
791	72	RGRCP	1346	1087.69	1082.90	0.00350	0.0130	28.27	18.85	1.50	251
792	84	RGRCP	638	1078.41	1076.21	0.00340	0.0130	38.48	21.99	1.75	374
793	84	RGRCP	1335	1082.90	1078.41	0.00340	0.0130	38.48	21.99	1.75	374
794	24	RGRCP	55	1073.50	1070.74	0.04870	0.0130	3.14	6.28	0.50	50
795	24	RGRCP	55	1073.50	1070.74	0.04870	0.0130	3.14	6.28	0.50	50
796	24	RGRCP	55	1073.50	1070.74	0.04870	0.0130	3.14	6.28	0.50	50
797	42	NA	325	0.00	0.00	NA	0.0130	9.62	11.00	0.88	#VALUE!
798	90	RGRCP	652	1067.17	1064.97	0.00340	0.0130	44.18	23.56	1.88	449
799	90	RGRCP	668	1069.43	1067.17	0.00340	0.0130	44.18	23.56	1.88	449
800	90	RGRCP	1327	1073.92	1069.43	0.00340	0.0130	44.18	23.56	1.88	449
801	24	RGRCP	11	1078.75	1073.92	0.02840	0.0130	3.14	6.28	0.50	38
802	24	RGRCP	64	1081.35	1078.75	0.04090	0.0130	3.14	6.28	0.50	46
803	90	RGRCP	678	1076.21	1073.92	0.00340	0.0130	44.18	23.56	1.88	449
828	36	NA	20	1057.54	1057.52	0.00100	0.0130	7.07	9.42	0.75	21
854	96	CMP	330	1057.86	1057.54	0.00100	0.0280	50.27	25.13	2.00	134
859	96	RGRCP	56	1056.19	1056.00	0.00340	0.0130	50.27	25.13	2.00	533
860	36	RGRCP	14	1060.85	1056.00	0.12040	0.0130	7.07	9.42	0.75	232
861	36	RGRCP	66	1061.05	1060.85	0.00300	0.0130	7.07	9.42	0.75	37
862	96	RGRCP	1258	1060.47	1056.22	0.00340	0.0130	50.27	25.13	2.00	533
863	96	RGRCP	661	1062.71	1060.47	0.00340	0.0130	50.27	25.13	2.00	533
864	24	RGRCP	58	1066.71	1065.77	0.01630	0.0130	3.14	6.28	0.50	29
865	90	RGRCP	613	1064.77	1062.71	0.00340	0.0130	44.18	23.56	1.88	449
866	90	RGRCP	33	1064.97	1064.90	0.00340	0.0130	44.18	23.56	1.88	449
896	48	HDPE	452	1064.85	1063.05	0.00330	0.0100	12.57	12.57	1.00	108
897	48	HDPE	660	1063.05	1060.70	0.00350	0.0100	12.57	12.57	1.00	111
898	48	HDPE	660	1058.38	1055.91	0.00350	0.0100	12.57	12.57	1.00	111
899	48	HDPE	660	1060.70	1058.38	0.00350	0.0100	12.57	12.57	1.00	111
900	48	HDPE	379	1066.09	1064.85	0.00330	0.0100	12.57	12.57	1.00	108

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
901	48	HDPE	203	1066.58	1066.09	0.00310	0.0100	12.57	12.57	1.00	104
902	48	HDPE	572	1068.37	1066.58	0.00310	0.0100	12.57	12.57	1.00	104
903	48	HDPE	601	1070.70	1068.37	0.00310	0.0100	12.57	12.57	1.00	104
904	48	HDPE	465	1076.10	1070.70	0.00310	0.0100	12.57	12.57	1.00	104
919	48	HDPE	600	1052.23	1054.61	0.00350	0.0100	12.57	12.57	1.00	111
923	48	RCP	59	0.00	0.00	0.00230	0.0130	12.57	12.57	1.00	69
924	48	NA	30	1052.83	1052.76	0.00230	0.0130	12.57	12.57	1.00	69
925	48	NA	432	1054.09	1052.83	0.00290	0.0130	12.57	12.57	1.00	78
926	48	NA	172	1054.61	1054.09	0.00330	0.0130	12.57	12.57	1.00	83
927	24	NA	5	1061.40	1061.30	0.02000	0.0130	3.14	6.28	0.50	32
931	48	HDPE	760	1055.91	1052.23	0.00350	0.0100	12.57	12.57	1.00	111
945	102	RGRCP	139	1052.85	1052.00	0.00460	0.0130	56.75	26.70	2.13	729
946	102	RGRCP	204	1053.34	1052.85	0.00240	0.0130	56.75	26.70	2.13	527
947	102	RGRCP	1106	1056.00	1053.34	0.00240	0.0130	56.75	26.70	2.13	527
948	30	CMP	1345	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
949	24	CMP	442	1058.50	1057.17	0.00300	0.0280	3.14	6.28	0.50	6
950	48	RCP	349	0.00	0.00	NA	0.0130	12.57	12.57	1.00	#VALUE!
951	48	RCP	208	0.00	0.00	NA	0.0130	12.57	12.57	1.00	#VALUE!
952	30	RGRCP	389	1039.80	1037.40	0.00350	0.0130	4.91	7.85	0.63	24
953	30	RGRCP	241	1037.40	1037.03	0.00200	0.0130	4.91	7.85	0.63	18
954	30	RGRCP	272	1037.03	1037.33	0.00200	0.0130	4.91	7.85	0.63	18
955	42	RGRCP	133	1044.73	1044.07	0.00500	0.0130	9.62	11.00	0.88	71
956	36	RGRCP	155	1045.75	1045.23	0.00500	0.0130	7.07	9.42	0.75	47
957	36	RGRCP	155	1046.77	1045.75	0.00500	0.0130	7.07	9.42	0.75	47
958	36	RGRCP	152	1047.53	1046.77	0.00500	0.0130	7.07	9.42	0.75	47
959	30	RGRCP	152	1048.90	1047.53	0.00500	0.0130	4.91	7.85	0.63	29
960	24	RGRCP	152	1050.17	1048.90	0.00500	0.0130	3.14	6.28	0.50	16
961	60	RGRCP	27	1156.00	1154.35	0.04300	0.0130	19.64	15.71	1.25	542
962	60	RGRCP	33	1156.40	1156.00	0.01180	0.0130	19.64	15.71	1.25	284
963	42	RGRCP	84	1156.69	1156.40	0.00230	0.0130	9.62	11.00	0.88	48
964	54	RGRCP	619	1159.40	1157.40	0.00323	0.0130	15.90	14.14	1.13	112
965	48	RGRCP	596	1161.80	1160.80	0.00200	0.0130	12.57	12.57	1.00	64
966	30	RGRCP	358	1163.11	1161.80	0.00400	0.0130	4.91	7.85	0.63	26
967	30	RGRCP	407	1163.13	1163.11	0.00200	0.0130	4.91	7.85	0.63	18
968	66	RGRCP	625	1145.35	1143.48	0.00300	0.0130	23.76	17.28	1.38	184
969	24	RGRCP	17	1159.60	1149.37	0.59480	0.0130	3.14	6.28	0.50	175
970	30	RGRCP	19	1155.50	1149.55	0.31310	0.0130	4.91	7.85	0.63	230
971	30	RGRCP	25	1149.55	1146.90	0.10820	0.0130	4.91	7.85	0.63	135
972	24	RGRCP	19	1157.00	1150.50	0.34210	0.0130	3.14	6.28	0.50	133
973	24	RGRCP	25	1150.50	1147.87	0.10740	0.0130	3.14	6.28	0.50	74
974	60	RGRCP	652	1150.06	1145.85	0.00650	0.0130	19.64	15.71	1.25	211
975	60	RGRCP	622	1154.10	1150.06	0.00650	0.0130	19.64	15.71	1.25	211
978	30	RGRCP	448	1159.93	1158.28	0.00300	0.0130	4.91	7.85	0.63	23
979	48	RGRCP	34	1157.18	1157.15	0.00440	0.0130	12.57	12.57	1.00	96
980	36	RGRCP	147	1157.78	1157.18	0.00400	0.0130	7.07	9.42	0.75	42
981	36	RGRCP	595	1160.57	1158.38	0.00400	0.0130	7.07	9.42	0.75	42
982	54	NA	600	1148.91	1145.68	0.00396	0.0130	15.90	14.14	1.13	124
983	54	NA	669	1151.68	1148.91	0.00396	0.0130	15.90	14.14	1.13	124
984	54	NA	46	1151.86	1151.68	0.00370	0.0130	15.90	14.14	1.13	120
985	48	NA	172	1153.22	1152.40	0.00810	0.0130	12.57	12.57	1.00	130
986	48	NA	544	1155.31	1153.72	0.00300	0.0130	12.57	12.57	1.00	79
987	48	NA	558	1156.93	1155.31	0.00300	0.0130	12.57	12.57	1.00	79
988	48	NA	20	1157.15	1156.93	0.00300	0.0130	12.57	12.57	1.00	79
989	24	RGRCP	416	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
990	24	RGRCP	418	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
991	24	RGRCP	255	1153.60	1151.90	0.40000	0.0130	3.14	6.28	0.50	143
992	24	RGRCP	378	0.00	0.00	0.30000	0.0130	3.14	6.28	0.50	124
993	24	RGRCP	212	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
994	24	RGRCP	955	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
995	24	RCP	123	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
996	24	RCP	50	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
997	24	RCP	50	0.00	0.00	NA.	0.0130	3.14	6.28	0.50	#VALUE!
998	24	RCP	137	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
999	24	RCP	208	1147.84	1147.73	NA	0.0130	3.14	6.28	0.50	#VALUE!
1000	24	RCP	331	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
1001	24	RCP	80	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
1002	36	RGRCP	410	0.00	0.00	NA	0.0130	7.07	9.42	0.75	#VALUE!
1003	36	RGRCP	355	0.00	0.00	NA	0.0130	7.07	9.42	0.75	#VALUE!
1004	36	RGRCP	350	0.00	0.00	NA	0.0130	7.07	9.42	0.75	#VALUE!
1005	30	RGRCP	404	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
1006	30	RGRCP	400	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
1007	30	RGRCP	419	1145.10	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
1015	42	RCP	316	1134.80	1134.42	NA	0.0130	9.62	11.00	0.88	#VALUE!
1016	30	RCP	170	1136.09	1134.80	NA	0.0130	4.91	7.85	0.63	#VALUE!
1017	24	RGRCP	64	1126.54	1126.38	0.00250	0.0130	3.14	6.28	0.50	11
1018	24	RCP	574	1129.31	1127.87	0.00250	0.0130	3.14	6.28	0.50	11
1019	24	RCP	536	1127.87	1126.54	0.00250	0.0130	3.14	6.28	0.50	11
1020	24	CP	717	1134.38	1131.23	NA	0.0130	3.14	6.28	0.50	#VALUE!
1021	30	NA	8	1059.64	1059.64	NA	0.0130	4.91	7.85	0.63	#VALUE!
1063	24	NA	70	1061.60	1061.40	0.00290	0.0130	3.14	6.28	0.50	12
1106	66	RCP	124	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
1107	66	RCP	125	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
1108	66	RCP	124	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
1109	66	RCP	126	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
1110	66	RCP	125	0.00	0.00	NA	0.0130	23.76	17.28	1.38	#VALUE!
1111	60	RCP	123	0.00	0.00	NA	0.0130	19.64	15.71	1.25	#VALUE!
1112	60	RCP	496	0.00	0.00	NA	0.0130	19.64	15.71	1.25	#VALUE!
1113	60	RCP	346	0.00	0.00	NA	0.0130	19.64	15.71	1.25	#VALUE!
1114	60	RCP	395	0.00	0.00	NA	0.0130	19.64	15.71	1.25	#VALUE!
1115	30	RGRCP	332	1037.33	1036.75	0.00200	0.0130	4.91	7.85	0.63	18
1116	30	RGRCP	332	1036.75	1035.78	0.00200	0.0130	4.91	7.85	0.63	18
1117	30	CMP	862	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1118	30	CMP	330	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1119	30	CMP	1153	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1120	30	CMP	801	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1121	30	RGRCP	37	1151.60	1145.00	0.17840	0.0130	4.91	7.85	0.63	174
1122	30	RGRCP	25	1145.00	1142.90	0.08400	0.0130	4.91	7.85	0.63	119
1123	24	RGRCP	57	1154.50	1152.00	0.04390	0.0130	3.14	6.28	0.50	48
1124	66	RGRCP	719	1143.48	1141.32	0.00300	0.0130	23.76	17.28	1.38	184
1125	66	RGRCP	55	1141.32	1141.20	0.00220	0.0130	23.76	17.28	1.38	158
1126	30	NA	92	1145.90	1145.77	0.00160	0.0130	4.91	7.85	0.63	16
1127	30	NA	340	1148.10	1146.40	0.00500	0.0130	4.91	7.85	0.63	29
1128	30	NA	26	1148.30	1148.10	0.00770	0.0130	4.91	7.85	0.63	36
1129	30	NA	72	1146.40	1145.90	0.00700	0.0130	4.91	7.85	0.63	34
1130	24	NA	85	1148.58	1148.41	0.00200	0.0130	3.14	6.28	0.50	10
1131	24	NA	40	1148.67	1148.58	0.00200	0.0130	3.14	6.28	0.50	10
1132	24	NA	170	1150.00	1148.58	0.01130	0.0130	3.14	6.28	0.50	24
1133	24	NA	33	1141.75	1140.20	0.00150	0.0130	3.14	6.28	0.50	9
1134	24	NA	209	1142.06	1141.75	0.00150	0.0130	3.14	6.28	0.50	9
1135	24	NA	360	1142.61	1142.06	0.00150	0.0130	3.14	6.28	0.50	9
1136	24	NA	428	1143.25	1142.61	0.00150	0.0130	3.14	6.28	0.50	9
1137	54	NA	174	1143.51	1143.25	0.00150	0.0130	15.90	14.14	1.13	76
1138	54	NA	151	1143.72	1143.51	0.00120	0.0130	15.90	14.14	1.13	68
1139	54	NA	587	1144.26	1143.72	0.00120	0.0130	15.90	14.14	1.13	68
1140	66	RGRCP	20	1145.00	1142.00	0.15000	0.0130	23.76	17.28	1.38	1304
1141	66	RGRCP	32	1142.00	1141.20	0.02500	0.0130	23.76	17.28	1.38	532
1142	30	RCP	986	1144.53	1144.04	0.00050	0.0130	4.91	7.85	0.63	9
1143	30	RCP	989	1145.03	1144.53	0.00050	0.0130	4.91	7.85	0.63	9
1144	30	RCP	1269	1146.16	1145.53	0.00050	0.0130	4.91	7.85	0.63	9
1145	24	RCP	771	1147.26	1146.16	0.00086	0.0130	3.14	6.28	0.50	7
1146	24	NA	146	1169.89	1167.30	0.01770	0.0130	3.14	6.28	0.50	30
1147	24	NA	190	1160.30	1150.00	0.05420	0.0130	3.14	6.28	0.50	53
1148	24	NA	210	1167.30	1160.30	0.03330	0.0130	3.14	6.28	0.50	41
1156	72	RCP	203	0.00	0.00	NA	0.0130	28.27	18.85	1.50	#VALUE!
1157	72	RCP	125	0.00	0.00	NA	0.0130	28.27	18.85	1.50	#VALUE!
1158	72	RCP	124	0.00	0.00	NA	0.0130	28.27	18.85	1.50	#VALUE!
1159	36	RGRCP	443	1035.78	0.00	0.00150	0.0130	7.07	9.42	0.75	26
1160	36	RGRCP	440	0.00	0.00	0.00150	0.0130	7.07	9.42	0.75	26
1161	36	RGRCP	440	0.00	1033.84	0.00150	0.0130	7.07	9.42	0.75	26
1162	36	RGRCP	396	1033.84	1033.23	0.00150	0.0130	7.07	9.42	0.75	26

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
1163	36	RGRCP	530	1033.23	1032.44	0.00150	0.0130	7.07	9.42	0.75	26
1164	36	RGRCP	128	0.00	0.00	0.00300	0.0130	7.07	9.42	0.75	37
1165	24	NA	25	1079.28	1075.92	0.13000	0.0130	3.14	6.28	0.50	82
1166	108	NA	557	1069.02	1067.04	0.00200	0.0130	63.62	28.27	2.25	560
1167	108	NA	294	1071.27	1070.76	0.00200	0.0130	63.62	28.27	2.25	560
1168	108	NA	567	1071.53	1071.27	0.00200	0.0130	63.62	28.27	2.25	560
1169	108	NA	494	1074.03	1071.53	0.00200	0.0130	63.62	28.27	2.25	560
1170	24	NA	491	1056.44	1054.22	0.00357	0.0130	3.14	6.28	0.50	14
1171	30	NA	352	1054.22	1054.10	0.00034	0.0130	4.91	7.85	0.63	8
1172	30	NA	648	1054.10	1053.29	0.00124	0.0130	4.91	7.85	0.63	15
1173	30	NA	416	1053.29	1052.53	0.00861	0.0130	4.91	7.85	0.63	38
1174	36	NA	528	1052.53	1052.16	0.00070	0.0130	7.07	9.42	0.75	18
1175	48	NA	70	1049.41	1049.20	0.00271	0.0130	12.57	12.57	1.00	75
1176	42	NA	255	1051.20	1050.87	0.00128	0.0130	9.62	11.00	0.88	36
1177	42	NA	285	1050.87	1050.21	0.00161	0.0130	9.62	11.00	0.88	41
1178	48	NA	283	1050.21	1049.55	0.00232	0.0130	12.57	12.57	1.00	69
1179	48	NA	385	1049.55	1049.41	0.00036	0.0130	12.57	12.57	1.00	27
1180	36	NA	140	1052.16	1051.20	0.00436	0.0130	7.07	9.42	0.75	44
1181	48	NA	124	0.00	0.00	NA	0.0130	12.57	12.57	1.00	#VALUE!
1182	24	RGRCP	10	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
1183	24	RCP	640	1141.13	1140.44	0.00108	0.0130	3.14	6.28	0.50	7
1184	24	RCP	570	1142.20	1141.63	0.00108	0.0130	3.14	6.28	0.50	7
1185	24	RCP	279	1142.58	1142.20	0.00097	0.0130	3.14	6.28	0.50	7
1186	24	RCP	981	1143.47	1142.58	0.00097	0.0130	3.14	6.28	0.50	7
1187	24	RCP	732	1144.18	1143.47	0.00097	0.0130	3.14	6.28	0.50	7
1188	30	RCP	114	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
1189	24	RGRCP	326	1136.36	1134.79	0.00400	0.0130	3.14	6.28	0.50	14
1190	27	RGRCP	334	1134.79	1133.71	0.00320	0.0130	3.98	7.07	0.56	18
1191	27	RGRCP	333	1133.71	1132.63	0.00320	0.0130	3.98	7.07	0.56	18
1192	27	RGRCP	337	1132.63	1130.55	0.00320	0.0130	3.98	7.07	0.56	18
1193	42	RGRCP	383	1130.55	1129.78	0.00200	0.0130	9.62	11.00	0.88	45
1197	42	RGRCP	18	1129.78	1129.73	0.00200	0.0130	9.62	11.00	0.88	45
1198	42	RGRCP	30	1126.60	1126.55	0.00170	0.0130	9.62	11.00	0.88	42
1199	42	RGRCP	382	1128.96	1129.73	0.00200	0.0130	9.62	11.00	0.88	45
1200	42	RGRCP	406	1128.01	1128.96	0.00170	0.0130	9.62	11.00	0.88	42
1201	42	RGRCP	406	1127.31	1128.01	0.00170	0.0130	9.62	11.00	0.88	42
1202	42	RGRCP	414	1126.60	1127.31	0.00170	0.0130	9.62	11.00	0.88	42
1206	108	NA	9	1073.45	1074.03	0.00200	0.0130	63.62	28.27	2.25	560
1207	30	RCP	507	0.00	0.00	NA	0.0130	4.91	7.85	0.63	#VALUE!
1208	30	RCP	373	1031.42	1029.87	0.00400	0.0130	4.91	7.85	0.63	26
1209	36	RGRCP	187	0.00	0.00	NA	0.0130	7.07	9.42	0.75	#VALUE!
1210	30	CMP	785	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1211	30	CMP	498	0.00	0.00	NA	0.0280	4.91	7.85	0.63	#VALUE!
1212	36	CMP	107	0.00	0.00	NA	0.0280	7.07	9.42	0.75	#VALUE!
1213	36	RGRCP	53	1029.19	1028.97	0.00410	0.0130	7.07	9.42	0.75	43
1214	36	RGRCP	295	0.00	0.00	NA	0.0130	7.07	9.42	0.75	#VALUE!
1215	24	CMP	500	1030.35	1027.80	0.00500	0.0280	3.14	6.28	0.50	7
1216	24	RGRCP	18	1042.25	1040.24	0.11170	0.0130	3.14	6.28	0.50	76
1217	24	RGRCP	36	1041.86	1040.58	0.03560	0.0130	3.14	6.28	0.50	43
1218	24	RGRCP	52	1042.75	1041.89	0.01740	0.0130	3.14	6.28	0.50	30
1219	48	RGRCP	262	1036.11	1035.70	0.00100	0.0130	12.57	12.57	1.00	46
1220	24	RGRCP	52	1043.44	1042.61	0.01610	0.0130	3.14	6.28	0.50	29
1221	48	RGRCP	290	1036.22	1036.11	0.00100	0.0130	12.57	12.57	1.00	46
1222	48	RGRCP	12	1036.41	1036.22	0.00100	0.0130	12.57	12.57	1.00	46
1223	24	RGRCP	21	1044.44	1044.10	0.01000	0.0130	3.14	6.28	0.50	23
1224	24	RGRCP	42	1044.10	1042.95	0.02740	0.0130	3.14	6.28	0.50	38
1225	36	RCP	868	1136.60	1135.90	0.00081	0.0130	7.07	9.42	0.75	19
1226	36	RCP	998	1137.41	1136.60	0.00081	0.0130	7.07	9.42	0.75	19
1227	36	RCP	830	1138.08	1137.41	0.00081	0.0130	7.07	9.42	0.75	19
1245	36	RCP	1054	1135.90	1133.87	0.00081	0.0130	7.07	9.42	0.75	19
1246	24	RGRCP	90	0.00	0.00	NA	0.0130	3.14	6.28	0.50	#VALUE!
1247	36	HDPE	25	1016.50	1016.04	0.01830	0.0100	7.07	9.42	0.75	118
1248	36	HDPE	315	1016.04	1015.03	0.00320	0.0100	7.07	9.42	0.75	49
1249	36	HDPE	321	1015.03	1014.00	0.00320	0.0100	7.07	9.42	0.75	49
1250	36	HDPE	165	0.00	0.00	0.00100	0.0100	7.07	9.42	0.75	27

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
1251	36	HDPE	157	0.00	0.00	0.00100	0.0100	7.07	9.42	0.75	27
1252	24	NA	26	0.00	0.00	0.06940	0.0130	3.14	6.28	0.50	60
1253	24	NA	42	0.00	0.00	0.00220	0.0130	3.14	6.28	0.50	11
1254	48	HDPE	188	1035.55	1035.40	0.00080	0.0100	12.57	12.57	1.00	53
1255	24	NA	27	0.00	0.00	0.06860	0.0130	3.14	6.28	0.50	59
1256	48	HDPE	20	1035.57	1035.55	0.00100	0.0100	12.57	12.57	1.00	59
1257	24	NA	14	1040.58	1040.55	0.00220	0.0130	3.14	6.28	0.50	11
1258	48	RGRCP	280	1035.70	1035.57	0.00100	0.0130	12.57	12.57	1.00	46
1259	102	RGRCP	4997	0.00	0.00	0.00220	0.0130	56.75	26.70	2.13	504
1260	96	RGRCP	1061	0.00	0.00	0.00300	0.0130	50.27	25.13	2.00	501
1261	90	RGRCP	1413	0.00	0.00	0.00300	0.0130	44.18	23.56	1.88	422
1262	84	RGRCP	2642	0.00	0.00	0.00300	0.0130	38.48	21.99	1.75	351
1263	54	RGRCP	1349	0.00	0.00	0.00360	0.0130	15.90	14.14	1.13	118
1264	42	RGRCP	176	0.00	0.00	0.00500	0.0130	9.62	11.00	0.88	71
1265	84	RGRCP	1279	0.00	0.00	0.00300	0.0130	38.48	21.99	1.75	351
1266	60	RGRCP	83	0.00	0.00	0.00500	0.0130	19.64	15.71	1.25	185
1267	42	RGRCP	311	0.00	0.00	0.00500	0.0130	9.62	11.00	0.88	71
1268	66	RGRCP	614	0.00	0.00	0.00420	0.0130	23.76	17.28	1.38	218
1269	36	RGRCP	224	0.00	0.00	0.00500	0.0130	7.07	9.42	0.75	47
1270	84	RGRCP	768	0.00	0.00	0.00325	0.0130	38.48	21.99	1.75	365
1271	72	RGRCP	902	0.00	0.00	0.00450	0.0130	28.27	18.85	1.50	285
1272	42	RGRCP	356	0.00	0.00	0.00375	0.0130	9.62	11.00	0.88	62
1273	84	RGRCP	378	0.00	0.00	0.00500	0.0130	38.48	21.99	1.75	453
1274	72	RGRCP	1353	0.00	0.00	0.00140	0.0130	28.27	18.85	1.50	159
1275	72	RGRCP	699	0.00	0.00	0.00100	0.0130	28.27	18.85	1.50	134
1276	72	RGRCP	42	0.00	0.00	0.10500	0.0130	28.27	18.85	1.50	1376
1277	72	RGRCP	694	0.00	0.00	0.00100	0.0130	28.27	18.85	1.50	134
1278	72	RGRCP	1204	0.00	0.00	0.00200	0.0130	28.27	18.85	1.50	190
1279	72	RGRCP	1329	0.00	0.00	0.00390	0.0130	28.27	18.85	1.50	265
1280	72	RGRCP	1318	0.00	0.00	0.00420	0.0130	28.27	18.85	1.50	275
1281	66	RGRCP	896	0.00	0.00	0.00520	0.0130	23.76	17.28	1.38	243
1282	66	RGRCP	657	0.00	0.00	0.00320	0.0130	23.76	17.28	1.38	190
1283	66	RGRCP	524	0.00	0.00	0.00230	0.0130	23.76	17.28	1.38	161
1284	66	RGRCP	141	0.00	0.00	0.00150	0.0130	23.76	17.28	1.38	130
1285	66	RGRCP	28	0.00	0.00	0.05920	0.0130	23.76	17.28	1.38	819
1286	66	RGRCP	197	0.00	0.00	0.00250	0.0130	23.76	17.28	1.38	168
1287	66	RGRCP	203	0.00	0.00	0.01370	0.0130	23.76	17.28	1.38	394
1288	60	RGRCP	657	0.00	0.00	0.00250	0.0130	19.64	15.71	1.25	131
1289	60	RGRCP	663	0.00	0.00	0.00150	0.0130	19.64	15.71	1.25	101
1290	60	RGRCP	83	0.00	0.00	0.00150	0.0130	19.64	15.71	1.25	101
1291	42	RGRCP	114	0.00	0.00	0.00360	0.0130	9.62	11.00	0.88	61
1292	36	RGRCP	66	0.00	0.00	0.08500	0.0130	7.07	9.42	0.75	195
1293	36	RGRCP	90	0.00	0.00	0.00460	0.0130	7.07	9.42	0.75	45
1294	24	RGRCP	102	0.00	0.00	0.04000	0.0130	3.14	6.28	0.50	45
1295	42	RGRCP	288	0.00	0.00	0.01480	0.0130	9.62	11.00	0.88	123
1296	24	RGRCP	92	0.00	0.00	0.06800	0.0130	3.14	6.28	0.50	59
1297	42	RGRCP	85	0.00	0.00	0.07600	0.0130	9.62	11.00	0.88	278
1298	42	RGRCP	78	0.00	0.00	0.02000	0.0130	9.62	11.00	0.88	143
1299	42	RGRCP	22	0.00	0.00	0.12000	0.0130	9.62	11.00	0.88	349
1300	42	RGRCP	88	0.00	0.00	0.00200	0.0130	9.62	11.00	0.88	45
1301	42	RGRCP	22	0.00	0.00	0.12580	0.0130	9.62	11.00	0.88	358
1302	42	RGRCP	65	0.00	0.00	0.00200	0.0130	9.62	11.00	0.88	45
1303	36	RGRCP	17	0.00	0.00	0.10730	0.0130	7.07	9.42	0.75	219
1304	36	RGRCP	194	0.00	0.00	0.00200	0.0130	7.07	9.42	0.75	30
1305	54	RGRCP	573	0.00	0.00	0.00310	0.0130	15.90	14.14	1.13	110
1306	48	RGRCP	626	0.00	0.00	0.00310	0.0130	12.57	12.57	1.00	80
1307	42	RGRCP	2427	0.00	0.00	0.00310	0.0130	9.62	11.00	0.88	56
1313	108		3810	0.00	0.00	0.00200	0.0130	63.62	28.27	2.25	560
1314	108		1455	0.00	0.00	0.00340	0.0130	63.62	28.27	2.25	730
1315	48	RGRCP	48	1146.00	1145.54	0.00480	0.0130	12.57	12.57	1.00	100
1316	54	RGRCP	196	1145.04	1144.10	0.00480	0.0130	15.90	14.14	1.13	137
1317	54	RGRCP	128	1144.10	1143.50	0.00470	0.0130	15.90	14.14	1.13	135
1318	60	RGRCP	550	1143.00	1138.57	0.00800	0.0130	19.64	15.71	1.25	234
1319	60	RGRCP	344	1138.57	1126.60	0.03480	0.0130	19.64	15.71	1.25	487
1320	66	RGRCP	742	1126.10	1119.15	0.00940	0.0130	23.76	17.28	1.38	326

1- Ratio's taken from table of ratio's of a partially filled circular pipe

SD_ID	Diameter (in)	Material	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Slope (ft/ft)	Manning's Roughness	Area[1] (ft^2)	Wetted Perimeter[1] (ft)	Hydraulic Radius[1]	Pipe Capacity (cfs)
1321	72	RGRCP	172	1118.65	1118.29	0.00210	0.0130	28.27	18.85	1.50	195
1322	72	RGRCP	340	1118.29	1117.61	0.00200	0.0130	28.27	18.85	1.50	190
1323	72	RGRCP	56	1117.61	1116.50	0.01980	0.0130	28.27	18.85	1.50	598
1324	60	RGRCP	219	1140.50	1122.50	0.08219	0.0130	19.64	15.71	1.25	749
1325	60	RGRCP	866	1123.00	1141.33	-0.02117	0.0130	19.64	15.71	1.25	#NUM!
1326	108	RGRCP	118	1133.40	1133.20	0.00180	0.0130	63.62	28.27	2.25	531
1327	108	RGRCP	1010	1135.33	1133.45	0.00180	0.0130	63.62	28.27	2.25	531
1328	108	RGRCP	578	1136.33	1135.33	0.00180	0.0130	63.62	28.27	2.25	531
1329	108	RGRCP	628	1133.20	1132.07	0.00180	0.0130	63.62	28.27	2.25	531
1330	108	RGRCP	264	1132.07	1131.59	0.00180	0.0130	63.62	28.27	2.25	531
1331	108	RGRCP	278	1131.59	1131.10	0.00180	0.0130	63.62	28.27	2.25	531
1332	108	RGRCP	1164	1131.10	1129.00	0.00180	0.0130	63.62	28.27	2.25	531
1333	72	RGRCP	88	1129.00	1128.57	0.00490	0.0130	28.27	18.85	1.50	297
1334	72	RGRCP	114	1128.57	1128.00	0.00500	0.0130	28.27	18.85	1.50	300
1335	30	RGRCP	202	1146.50	1145.00	0.00750	0.0130	4.91	7.85	0.63	36
1336	42	RGRCP	192	1144.00	1143.50	0.00260	0.0130	9.62	11.00	0.88	51
1337	60	RGRCP	98	1142.66	1141.75	0.00930	0.0130	19.64	15.71	1.25	252
1338	60	RGRCP	76	1141.75	1141.19	0.00740	0.0130	19.64	15.71	1.25	225
1339	60	RGRCP	88	1141.19	1140.59	0.00680	0.0130	19.64	15.71	1.25	215
1340	72	RGRCP	280	1140.59	1138.60	0.00720	0.0130	28.27	18.85	1.50	360
1341	78	RGRCP	410	1138.55	1137.74	0.00200	0.0130	33.18	20.42	1.63	235
1342	78	RGRCP	428	1137.74	1137.01	0.00170	0.0130	33.18	20.42	1.63	217
1343	84	RGRCP	402	1137.01	1136.33	0.00170	0.0130	38.48	21.99	1.75	264
1344	60	RGRCP	642	0.00	0.00	0.01890	0.0130	19.64	15.71	1.25	359
1345	60	RGRCP	660	0.00	0.00	0.00260	0.0130	19.64	15.71	1.25	133
1346	54	RGRCP	660	0.00	0.00	0.00350	0.0130	15.90	14.14	1.13	117
1347	54	RGRCP	660	0.00	0.00	0.00270	0.0130	15.90	14.14	1.13	102
1348	54	RGRCP	630	0.00	0.00	0.00190	0.0130	15.90	14.14	1.13	86
1349	48	RGRCP	660	0.00	0.00	0.00230	0.0130	12.57	12.57	1.00	69

Kimley-Horn and Associates, Inc.

Project: ***Glendale Stormwater Management Plan***
Subject: **87th Avenue Detention Basin - Extrapolation of Storage-Discharge Curve**
Model: **Glendale/Peoria**
Designed by: **LAT** Date 1/14/2010
Checked by: **MAF** Date 1/18/2010

KHA Project No. 091910009
City of Glendale No. 089017

Detention Basin - SRPP87

Elevation [ft]	Surface Area [sq ft]	Volume [cu ft]	Volume [ac ft]	H1 [ft]	H2 [ft]	Q1 [cfs]	Q2 [cfs]	Total Q [cfs]	Bypass Flows [cfs]	Hs [ft]	Spillway [cfs]	Total Q [cfs]	
1313	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1314	70608	35304	0.81	0.00	0.23	0.00	12.11	12.11	12.11	0.00	0.00	0.00	
1315	157478	149347	3.43	1.23	1.23	27.85	27.85	55.70	21.57	0.00	0.00	34.13	
1316	169554	312863	7.18	2.23	2.23	37.48	37.48	74.96	21.57	0.00	0.00	53.39	
1317	180871	488076	11.20	3.23	3.23	45.10	45.10	90.19	21.57	0.00	0.00	68.62	
1318	188761	672892	15.45	4.23	4.23	51.60	51.60	103.20	21.57	0.00	0.00	81.63	
1319	196472	865508	19.87	5.23	5.23	57.37	57.37	114.74	21.57	0.00	0.00	93.17	
1320	204093	1065791	24.47	6.23	6.23	62.61	62.61	125.23	21.57	0.00	0.00	103.66	
1321	211648	1273661	29.24	7.23	7.23	67.45	67.45	134.90	21.57	0.00	0.00	113.33	
1321.7	211648	1421815	32.64	7.93	7.93	70.64	70.64	141.28	21.57	0.00	0.00	119.71	*
1322	211648	1485309	34.10	8.23	8.23	71.96	71.96	143.92	21.57	0.30	85.44	207.80	*
1322.5		1580551	36.28	8.73	8.73	74.11	74.11	148.23	21.57	0.80	372.08	498.74	*
1322.9	211648	1675792	38.47	9.13	9.13	75.79	75.79	151.58	21.57	1.20	683.56	813.57	*

Notes:

Orifice Equation

$$Q = C_d A_o (2gH)^{0.5}$$

Cd 0.62 ---
g 32.2 ft/sec^2

Weir Equation

$$Q = CLH^{3/2}$$

C 2.6 ---
L 200 ft

Orifice Details

Orifice [---]	Elevation [ft]	Diameter [in]	Area [sq ft]	Center Elev [ft]	Bypass Elev [ft]
1	1312.5	30.4	5.04	1313.77	1313.77
2	1312.5	30.4	5.04	1313.77	1314.51

Data from Table 1-1 of *Final Drainage Report, 83rd Avenue/Pinnacle Peak Road Drainage Improvements* , January 2006

* Calculations added from data provided elsewhere in the report

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRAM59**
Model: **Glendale/Peoria**
Designed by: **JSN** Date 12/2/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRAM59

Outlet Diameter	4.50 ft	Outlet X-Sect Area	15.904 ft^2
Outlet Elevation	1214.5 ft	No. of Outlet Barrels	1
Overflow Weir Length	250 ft	Outlet Pipe Slope	0.004 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1214.5	4,596	0.11				0	0	0	0
			0.42	0.5	0.21				
1215	31,655	0.73				0.21	3.24	0	3.24
			0.87	3.0	2.61				
1218	44,162	1.01				2.82	118.11	0	118.11
			1.36	6.0	8.13				
1224	73,900	1.70				10.95	206.19	0	206.19
Overtopping									
			1.73	0.5	0.87				
1224.5	77,035	1.77				11.82	213.19	238.65	451.8
			1.77	1.0	1.77				
1225	80,170	1.84				12.72	219.96	675.00	895.0
			2.17	1.0	2.17				
1226	109,146	2.51				14.89	232.91	1909.19	2142.1

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Data from Plan #18065 - *59th Avenue Detention Basin,* City of Glendale, August 1990

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRPE67**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRPE67

Overflow Weir Length 900 ft Weir Coefficient 2.7

Elevation [ft]	Surface Storage Area [ft²]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
87	215,862	4.96				0	0	0	0
			5.24	1.0	5.24				
88	240,427	5.52				5.24	0.00	0	0.00
			6.03	1.0	6.03				
89	285,165	6.55				11.27	0.00	0	0.00
Overtopping									
			6.98	0.2	1.40				
89.2	322,916	7.41				12.67	0.00	217.35	217.3
			7.63	0.8	6.11				
90	342,079	7.85				18.77	0.00	2430.00	2430.00
			8.04	1.0	8.04				
91	358,093	8.22				26.81	0.00	6873.08	6873.08
			8.39	1.0	8.39				
92	372,632	8.55				35.20	0.00	12,626.65	12,626.65

Notes:

a) Stage-Storage data developed from Plan #11567 - *Sunnyside Park* As-built Records, City of Glendale, 1991

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRBR63**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRBR63

Outlet Diameter	2.50 ft	Outlet X-Sect Area	4.909 ft^2
Outlet Elevation	57 ft	No. of Outlet Barrels	1
Overflow Weir Length	440 ft	Outlet Pipe Slope	0.004 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
57	26,047	0.60				0	0	0	0
			0.83	1.0	0.83				
58	46,342	1.06				0.83	8.74	0	8.74
			1.12	1.0	1.12				
59	51,407	1.18				1.95	25.36	0	25.36
			1.41	4.0	5.64				
63	71,386	1.64				7.59	51.51	0	51.51
Overtopping									
			1.82	0.3	0.45				
63.25	87,013	2.00				8.05	52.85	148.5	201.35
			2.00	0.5	1.00				
63.5	102,641	2.36				8.59	54.16	420.02	474.2

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storage data developed from Plan #14408 - *Sahuaro Ranch Park-Phase VI* Civil Survey, City of Glendale, 1988

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SR67MV**
Model: **Maryvale**
Designed by: **JSN** Date 12/1/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SR67MV

Outlet Diameter	2.50 ft	Outlet X-Sect Area	4.909 ft^2
Outlet Elevation	1169.5 ft	No. of Outlet Barrels	1
Overflow Weir Length	530 ft	Outlet Pipe Slope	0.004 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1170	92,643	2.13				0	0	0	0
			2.29	1.0	2.29				
1171	106,702	2.45				2.29	17.43	0	17.43
Overtopping									
			2.58	0.3	0.65				
1171.25	118,425	2.72				2.93	21.72	178.88	200.6
			2.72	0.5	1.36				
1171.5	130,149	2.99				3.65	25.36	505.93	531.3
			2.99	1.0	2.99				
1172	153,595	3.53				5.28	25.94	1431.00	1456.9

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storgage data developed from Plan #10168 - *Chaparral Ranch Retention Basin,* City of Glendale, August 1984

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SROL71**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2008 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SROL71

Outlet Diameter	4.50 ft	Outlet X-Sect Area	15.904 ft^2
Outlet Elevation	1128 ft	No. of Outlet Barrels	1
Overflow Weir Length	950 ft	Outlet Pipe Slope	0.005 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1128	2,762	0.06				0	0	0	0
			4.39	2.0	8.78				
1130	379,588	8.71				8.78	56.66	0	56.66
			9.17	2.0	18.34				
1132	419,094	9.62				27.11	147.37	0	147.37
			10.06	2.0	20.13				
1134	457,753	10.51				47.24	148.29	0	148.29
			10.95	2.0	21.91				
1136	496,508	11.40				69.15	183.63	0	183.63
			11.89	2.0	23.79				
1138	539,782	12.39				92.94	213.19	0	213.19
Overtopping									
			12.61	1.0	12.61				
1139	559,213	12.84				105.55	226.52	2565	2791.52
			12.84	2.0	25.68				
1140	578,643	13.28				118.61	239.12	7254.92	7494.0

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data developed using topography obtained from FCDMC.

c) Slope of outlet pipe was assumed to be 0.005 ft/ft.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SROL83**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SROL83

Outlet Diameter	4.50 ft	Outlet X-Sect Area	15.904 ft^2
Outlet Elevation	1118 ft	No. of Outlet Barrels	1
Overflow Weir Length	500 ft	Outlet Pipe Slope	0.005 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1118	81,444	1.87				0	0	0	0
			2.73	2.0	5.45				
1120	156,102	3.58				5.45	56.66	0	56.66
			3.81	2.0	7.62				
1122	175,799	4.04				13.07	147.37	0	147.37
			4.27	2.0	8.53				
1124	195,882	4.50				21.61	148.29	0	148.29
Overtopping									
			4.60	0.5	2.30				
1124.5	204,784	4.70				23.90	157.87	477.30	635.17
			4.70	1.0	4.70				
1125	213,686	4.91				26.31	166.90	1350	1516.90
			4.91	2.0	9.81				
1126	231,491	5.31				31.42	183.63	3818.38	4002.0

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data developed using topography obtained from FCDMC.

c) Slope of outlet pipe was assumed to be 0.005 ft/ft.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRNO59**
Model: **Maryvale**
Designed by: **JSN** Date 12/2/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin -SRNO59

Overflow Weir Length 900 ft Weir Coefficient 2.7

Elevation [ft]	Surface Storage Area [ft²]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
96	47,624	1.09				0	0	0	0
			1.87	1.0	1.87				
97	115,535	2.65				1.87	0.00	0	0.00
			2.78	1.0	2.78				
98	126,460	2.90				4.65	0.00	0	0.00
			3.03	1.0	3.03				
99	137,747	3.16				7.68	0.00	0	0.00
Overtopping									
			7.91	1.0	7.91				
100	551,473	12.66				15.59	0.00	2430.00	2430.0

Notes:

a) Stage-Storage data combined from Plan #15595 - *Butler Park Detention Basin Plan* As-Built Record, City of Glendale, 1991 and #14661 - *Butler Park Street Improvements Retention Basin* , City of Glendale, 1990

b) Overtopping area was calculated using topography obtained from FCDMC.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGR75**
Model: **Maryvale**
Designed by: **ZRS** Date 10/6/2010 KHA Project No. 091910009
Checked by: **MAF** Date 10/7/2010 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRGR75

Outlet Diameter	2.00 ft	No. of Outlet Barrels	1
Outlet Elevation	1117.25 ft	Outlet Pipe Slope	0.00117 ft/ft
Outlet X-Sect Area	3.142 ft^2	Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Weir Length [ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1118	2,426	0.06				0		0	0	0
			0.39	1.0	0.39		0			
1119	31,560	0.72				0.39		8.13	0	8.13
			1.69	1.0	1.69		0			
1120	116,001	2.66				2.08		20.01	0	20.01
			2.74	1.0	2.74		0			
1121	122,999	2.82				4.83		25.08	0	25.08
			2.91	1.0	2.91		0			
1122	130,169	2.99				7.73		29.29	0	29.29
			3.16	2.0	6.31		0			
1124	144,846	3.33				14.05		36.27	0	36.27
			3.50	2.0	7.00		0			
1126	159,929	3.67				21.04		42.11	0	42.11
			3.85	2.0	7.70		0			
1128	175,417	4.03				28.74		47.23	0	47.23
			4.21	2.0	8.42		0			
1130	191,310	4.39				37.16		51.85	0	51.85
			4.58	2.0	9.16		0			
1132	207,606	4.77				46.32		56.09	0	56.09
			4.96	2.0	9.92		0			
1134	224,306	5.15				56.23		60.03	0	60.03
			5.35	2.0	10.69		0			
1136	241,410	5.54				66.93		63.73	0	63.73
			5.64	1.0	5.64		0			
1137	250,114	5.74				72.57		65.50	0	65.50
Overtopping										
			5.79	0.5	2.90					
1137.5	254,503	5.84				75.46	250	66.37	238.65	305.02
			5.89	0.5	2.95					
1138	258,918	5.94				78.41	500	67.22	1350.00	1417.22

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storage data obtained from *State Highway, Wickenburg-Phoenix Highway (US60), Grand Ave: 75th Ave-Olive Ave* , As-built Records, ADOT, 2004.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRNO91**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRNO91

Outlet Diameter	2.00 ft	Outlet X-Sect Area	3.142 ft^2
Outlet Elevation	1088.458 ft	No. of Outlet Barrels	1
Overflow Weir Length	2078 ft	Outlet Pipe Slope	0.0021 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1089.2	59,938	1.38				0	0	0	0
			4.12	1.7	7.00				
1090.9	298,805	6.86				7.00	18.16	0	18.16
			9.28	1.6	14.84				
1092.5	509,399	11.69				21.84	26.38	0	26.38
			12.22	3.3	40.34				
1095.8	555,615	12.76				62.18	38.09	0	38.09
Overtopping									
			12.86	0.4	5.31				
1096.2	565,117	12.97				67.49	39.31	1486.43	1525.75
			13.08	0.4	5.40				
1096.6	574,619	13.19				72.89	40.50	4204.27	4244.76
			13.41	0.8	11.06				
1097.5	593,623	13.63				83.95	42.76	11891.46	11934.22
			13.63	3.3	44.97				
1099.1	631,632	14.50				107.16	46.97	33634.13	33681.1

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Areas were obtained from *Northern & Butler Storm Drains, Sub-Phase "A", Phase II Plans* (Peoria Basin)

c) Elevation is in meters on plans and was converted to feet for developing stage-storage relationship

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRBH51W**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRBH51W

		Outlet X-Sect Area	3.142 ft^2
Outlet Diameter	2.00 ft	No. of Outlet Barrels	1
Outlet Elevation	1146.45 ft	Outlet Pipe Slope	0.0015 ft/ft
Overflow Weir Length	600 ft	Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1146	2,917	0.07				0	0	0	0
			1.00	2.0	1.99				
1148	83,791	1.92				1.99	8.29	0	8.29
			5.21	2.0	10.42				
1150	370,110	8.50				12.41	24.16	0	24.16
Overtopping									
			9.88	1.0	9.88				
1151	491,030	11.27				22.30	28.50	1620.00	1648.5

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data developed using topography obtained from FCDMC.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRBH51E**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRBH51E

Overflow Weir Length 1000 ft Weir Coefficient 2.7

Elevation [ft]	Surface Storage Area [ft²]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1152	174,382	4.00				0	0	0	0
			4.61	2.0	9.22				
1154	227,409	5.22				9.22	0.00	0	0.00
			5.42	2.0	10.84				
1156	244,713	5.62				20.06	0.00	0	0.00
Overtopping									
			10.85	1.0	10.85				
1157	700,146	16.07				30.91	0.00	2700.00	2700.0

Notes:

a) Stage-storage data developed using topography obtained from FCDMC.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGR67**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

HEC-1 Input

```
1109          KK    67NK
              * RESERVOIR STORAGE
1110          KO       0       0     0.0       0      22
1111          RS       1    FLOW     0.0     0.0
              * 59GC Volume
1112          SV     0.0   39.27  156.58  183.54  211.71  240.98  271.86  304.09  475.82
              * 59GC Storage elev
1113          SE  1131.0  1136.0  1141.0  1142.0  1143.0  1144.0  1145.0  1146.0  1151.0
              * 59GC Outflow
1114          SQ     0.0   125.0   125.0   125.0   125.0   125.0   130.0   925.0
              * 59GC Outflow elev
1115          SE  1131.0  1131.1  1136.0  1141.0  1142.0  1143.0  1144.0  1145.0
```

Notes:
HEC-1 input excerpt from Appendix D of *Determination of Mapping and Floodzone Changes and Elevation Certificates,*
Technical Data Notebook, City of Glendale Project #056017, prepared by Project Engineering Consultants, Ltd., September 2008

E.1 Storm Drain Flow Calculations

Reach	Slope (ft/ft)	Manning n	Pipe D (in.)	Area (ft^2)	Hydraulic Radius (ft)	Q (cfs)	Q added @ Location (cfs)
67N_BASIN	0.0023	0.013	60	19.635	1.25	124.90	125

Notes:
67N_BASIN is the reach. From Appendix E of *Determination of Mapping and Floodzone Changes and Elevation Certificates,*
Technical Data Notebook, City of Glendale Project #056017, prepared by Project Engineering Consultants, Ltd., September 2008

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGR67**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

E.2 Weir Calculations

Basin 67N

Discharge (cfs)	HW Elev. (ft)
0	1,143.90
50	1,144.25
100	1,144.37
150	1,144.46
200	1,144.52
250	1,144.58
300	1,144.64
350	1,144.69
400	1,144.73
450	1,144.77
500	1,144.81
550	1,144.85
600	1,144.88

Notes:
67N_BASIN is the reach. From Appendix E of *Determination of Mapping and Floodzone Changes and Elevation Certificates,* Technical Data Notebook, City of Glendale Project #056017, prepared by Project Engineering Consultants, Ltd., September 2008

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGR67**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRGR67

Outlet Diameter	5.00 ft	Outlet X-Sect Area	19.635 ft^2
Outlet Elevation	1129.5 ft	No. of Outlet Barrels	1
Overflow Weir Length	450 ft	Outlet Pipe Slope	0.0023 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1130	15,912	0.37				0	0	0	0
			2.25	1.0	2.25				
1131	179,810	4.13				2.25	24.46	0	24.46
			9.13	1.0	9.13				
1132	615,541	14.13				11.38	62.45	0	62.45
			19.94	1.0	19.94				
1133	1,121,848	25.75				31.32	104.57	0	104.57
			26.44	1.0	26.44				
1134	1,181,373	27.12				57.76	133.12	0	133.12
			27.63	3.0	82.88				
1136	1,225,441	28.13				140.64	189.08	0	189.08
			29.68	8.0	237.41				
1142	1,359,949	31.22				378.04	298.97	0	298.97
Overtopping									
			31.66	1.0	31.66				
1143	1,398,622	32.11				409.71	313.56	1215.00	1528.6
			34.53	2.0	69.05				
1145	1,609,223	36.94				478.76	340.88	6313.33	6654.2

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data developed from Orangewood Avenue Storm Drain Sub-Phase "C" As-built records, 2000.

c) Data from HEC-1 did not match as-built data. As-built data was used.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SROW75**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SROW75

Outlet Diameter	5.50 ft	Outlet X-Sect Area	23.758 ft^2
Outlet Elevation	1123.5 ft	No. of Outlet Barrels	1
Overflow Weir Length	500 ft	Outlet Pipe Slope	0.5377 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1121	317,747	7.29				0	0	0	0
			8.74	1.0	8.74				
1122	443,770	10.19				8.74	0.00	0	0.00
			11.62	1.0	11.62				
1123	568,317	13.05				20.36	0.00	0	0.00
			14.00	1.0	14.00				
1124	651,699	14.96				34.36	42.07	0	42.07
			15.17	1.0	15.17				
1125	669,983	15.38				49.53	400.46	0	400.46
			15.59	1.0	15.59				
1126	688,350	15.80				65.12	1044.02	0	1044.02
			16.23	2.0	32.45				
1128	725,266	16.65				97.58	2458.51	0	2458.51
Overtopping									
			20.64	1.0	20.64				
1129	1,072,788	24.63				118.22	2462.42	1350.00	3812.4

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storage data developed from Plan #25135 - *Orangewood Avenue Storm Drain* As-built Records, City of Glendale, 1980

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRISGC**
Model: **Maryvale**
Designed by: **JSN** Date 12/2/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRISGC

Outlet Diameter	8.00 ft	Outlet X-Sect Area	50.265 ft^2
Outlet Elevation	85 ft	No. of Outlet Barrels	1
Overflow Weir Length	1030 ft	Outlet Pipe Slope	0.0001 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
85	26,136	0.60				0	0	0	0
			1.52	1.0	1.52				
86	106,193	2.44				1.52	3.04	0	3.04
			3.09	1.0	3.09				
87	163,316	3.75				4.61	12.49	0	12.49
			4.12	2.0	8.24				
89	195,483	4.49				12.85	45.60	0	45.60
			4.80	2.0	9.61				
91	222,965	5.12				22.46	83.17	0	83.17
			5.43	2.0	10.87				
93	250,494	5.75				33.32	91.21	0	91.21
			6.08	2.0	12.15				
95	278,930	6.40				45.48	592.84	0	592.84
Overtopping									
			6.49	0.5	3.25				
95.5	286,499	6.58				48.72	617.05	983.23	1600.28
			6.58	1.0	6.58				
96	294,067	6.75				52.06	640.34	2781.00	3421.3

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data was developed from as-built contours (from Bethany Home Outfall Channel TDN for CLOMR, January 2003)

c) Outlet pipe has an adverse slope. The slope was approximated as 0.0001 ft/ft.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGC75**
Model: **Maryvale**
Designed by: **JSN** Date 11/23/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/9/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRGC75

Outlet Elevation 1082.15 ft
Overflow Weir Length 0 ft
Outlet Channel Width 14.00 ft
Outlet Channel Slope 0.000992 ft/ft
Weir Coefficient 2.7

Elevation [ft]	Surface Storage Area [ft²]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	$Q_{channel}$ [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1083	6,594	0.15				0	35.62	0	35.61583
			0.76	1.0	0.76				
1084	59,662	1.37				0.76	120.18	0	120.18
			1.37	2.0	2.74				
1085	112,731	2.59				2.74	229.95	0	229.95
			3.72	1.0	3.72				
1086	211,376	4.85				6.46	355.91	0	355.91
			4.85	2.0	9.71				
1087	310,021	7.12				12.44	493.12	0	493.12
			7.85	1.0	7.85				
1088	373,623	8.58				20.29	638.53	0	638.53
			8.58	2.0	17.15				
1089	437,224	10.04				29.60	790.15	0	790.15
			10.65	1.0	10.65				
1090	490,779	11.27				40.25	946.58	0	946.58
			11.27	2.0	22.53				
1091	544,333	12.50				52.13	1106.82	0	1106.82
			13.12	1.0	13.12				
1092	598,428	13.74				65.25	1270.14	0	1270.14
			13.74	2.0	27.48				
1093	652,523	14.98				79.61	1435.98	0	1435.98
1094		-				94.80	1603.91	0	1603.91
Overtopping									
1094.5		-				103.10	1688.56	0.00	1688.56
1095		-				111.40	1773.60	0.00	1773.6

Notes:

a) Data from Bethany Home Outfall Channel Reach B, Record Drawings, PCN No. 620 03 32, June 2007

b) Volume at elevations 1094 and 1095 from DMJM HEC-1 model update, Nov 2004

c) SE and SV recods taken from PEC model. Calculations above were completed to obtain SQ record values.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGC53**
Model: **Maryvale**
Designed by: **JSN** Date 12/2/2009 KHA Project No. 091910009
Checked by: **MAF** Date 12/8/2009 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRGC53

Outlet Diameter	3.00 ft	Outlet X-Sect Area	7.069 ft^2
Outlet Elevation	1093.84 ft	No. of Outlet Barrels	1
Overflow Weir Length	466 ft	Outlet Pipe Slope	0.0024 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1094	4,559	0.10				0	0.18	0	0.18008
			1.95	1.0	1.95				
1095	165,130	3.79				1.95	10.35	0	10.34643
			3.92	1.0	3.92				
1096	176,042	4.04				5.86	28.36	0	28.36
			4.17	1.0	4.17				
1097	187,376	4.30				10.04	43.85	0	43.85
			5.19	1.0	5.19				
1098	264,391	6.07				15.22	55.51	0	55.51
			6.93	1.0	6.93				
1099	339,657	7.80				22.15	65.11	0	65.11
			9.58	1.0	9.58				
1100	495,263	11.37				31.74	73.47	0	73.47
			12.83	1.0	12.83				
1101	622,688	14.29				44.57	80.97	0	80.97
			14.93	1.0	14.93				
1102	677,915	15.56				59.50	87.83	0	87.83
			16.09	1.0	16.09				
1103	723,759	16.62				75.59	94.20	0	94.20
Overtopping									
			18.19	1.0	18.19				
1104	884,237	20.30				93.78	100.16	1258.2	1358.36

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-storage data was developed from Maryvale Baseball Park Grading and Drainage As-built records, City of Phoenix, 1997

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRTM27**
Model: **Maryvale**
Designed by: **MAF** Date 3/18/2010 KHA Project No. 091910009
Checked by: **LAT** Date 5/18/2010 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRTM27

Outlet Diameter	2.00 ft	Outlet X-Sect Area	3.142 ft^2
Outlet Elevation	1087.22 ft	No. of Outlet Barrels	1
Overflow Weir Length	500 ft	Outlet Pipe Slope	0.0423 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1088	10,869	0.25				0	0	0	0
			0.46	1.0	0.46				
1089	29,239	0.67				0.46	49.34	0	49.34
			0.94	1.0	0.94				
1090	52,688	1.21				1.40	20.18	0	20.18
			1.66	1.0	1.66				
1091	91,913	2.11				3.06	25.22	0	25.22
			2.66	1.0	2.66				
1092	139,782	3.21				5.72	29.41	0	29.41
			3.31	1.0	3.31				
1093	148,597	3.41				9.03	33.07	0	33.07
			3.51	1.0	3.51				
1094	157,338	3.61				12.54	36.37	0	36.37
			3.71	1.0	3.71				
1095	166,256	3.82				16.26	39.39	0	39.39
			3.74	1.0	3.74				
1096	177,530	4.08				20.00	42.19	0	42.19
Overtopping									
			4.08	0.5	2.04				
1096.5	177,530	4.08				22.04	43.53	477.30	520.82
			4.08	1.0	4.08				
1097	177,530	4.08				24.08	44.82	1350.00	1394.8

Notes:
a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.
b) Stage-storage data was developed from *26th Avenue and Verde Land Drainage Improvement Project Phase II* Plans, City of Phoenix, November 2005.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRGR27**
Model: **Maryvale**
Designed by: **MAF** Date 2/11/2010 KHA Project No. 091910009
Checked by: **LAT** Date 5/18/2010 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRGR27

Outlet Diameter	1.50 ft	Outlet X-Sect Area	1.767 ft^2
Outlet Elevation	1084.5 ft	No. of Outlet Barrels	1
Overflow Weir Length	290 ft	Outlet Pipe Slope	0.0048 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1084	3,514	0.08				0	0	0	0
			0.34	1.0	0.34				
1085	26,047	0.60				0.34	1.74	0	1.74
			1.75	1.0	1.75				
1086	126,371	2.90				2.09	7.28	0	7.28
			3.20	2.0	6.40				
1088	152,479	3.50				8.49	14.11	0	14.11
			3.67	2.0	7.35				
1090	167,617	3.85				15.84	18.54	0	18.54
			4.03	2.0	8.05				
1092	183,072	4.20				23.89	22.11	0	22.11
			4.39	2.0	8.78				
1094	199,177	4.57				32.66	25.17	0	25.17
			4.76	2.0	9.53				
1096	215,769	4.95				42.19	27.90	0	27.90
			5.11	1.0	5.11				
1097	229,313	5.26				47.30	29.17	0	29.17
Overtopping									
			5.26	0.5	2.63				
1097.5	229,313	5.26				49.93	29.78	276.83	306.61
			5.26	0.5	2.63				
1098	229,313	5.26				52.56	30.38	783.00	813.38
			5.26	1.0	5.26				
1098.5	229,313	5.26				57.83	30.97	1438.46	1469.4

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storage data developed from *State Highway Wickenburg-Phoenix Highway (US 60), 27th Avenue/Thomas Road* As-built Records, ADOT, August 2006.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRMD99**
Model: **Maryvale**
Designed by: **MAF** Date 2/16/2010 KHA Project No. 091910009
Checked by: **LAT** Date 5/18/2010 City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRMD99

Weir Coefficient 2.7

Elevation [ft]	Surface Storage Area [ft²]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Weir Length [ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1022	435,307	9.99				0		0	0	0
			11.86	1.0	11.86		0.00			
1023	597,905	13.73				11.86		0.00	0	0.00
			15.59	1.0	15.59		0.00			
1024	760,503	17.46				27.45		0.00	0	0.00
Overtopping										
			22.02	0.5	11.01					
1024.5	1,157,735	26.58				38.46	1680	0.00	1603.72	1603.72
			31.14	0.5	15.57					
1025	1,554,966	35.70				54.03	2700	0.00	7290.00	7290.00
			44.82	1.0	44.82					
1026	2,349,429	53.94				98.85	3720	0.00	28,408.72	28,408.7

Notes:

a) Stage-storage data developed using topography obtained from FCDMC.

Kimley-Horn and Associates, Inc.

Project: ***Glendale Area SMP***
Subject: **Detention Basin Calculations - SRINLO**
Model: **Maryvale**
Designed by: **MAF** Date 2/16/2010
Checked by: **LAT** Date 5/18/2010

KHA Project No. 091910009
City of Glendale No. 089017

Objective: To determine the Stage-Storage-Discharge relationship for regional detention basins

Detention Basin - SRINLO

Outlet Diameter	3.50 ft	Outlet X-Sect Area	9.621 ft^2
Outlet Elevation	1002.29 ft	No. of Outlet Barrels	1
		Outlet Pipe Slope	0.002 ft/ft
		Weir Coefficient	2.7

Elevation [ft]	Surface Storage Area [ft^2]	Surface Storage Area [acre]	Average Area [acre]	Δ Elev [ft]	Δ Vol [ac-ft]	Σ Vol [ac-ft]	Weir Length [ft]	Q_{pipe} [cfs]	Q_{weir} [cfs]	Total Q_{out} [cfs]
1002.3	-	-				0		0	0	0
			7.03	2.2	15.47		11			
1004.5	612,500	14.06				15.47		32.63	0	32.63
			16.91	11.3	191.05		850			
1015.8	860,468	19.75				206.52		158.86	0	158.86
Overtopping										
			19.80	0.2	3.96					
1016	864,857	19.85				210.48	855	160.21	206.42	366.63
			19.98	0.5	9.99					
1016.5	875,829	20.11				220.47	867	163.52	1370.45	1533.97
			20.48	1.5	30.73					
1018	908,745	20.86				251.20	902	173.09	7950.38	8123.46
			21.37	2.0	42.73					
1020	952,634	21.87				293.93	950	185.07	22,078.08	22,263.2

Notes:

a) Q_{pipe} goes from Mannings Eqn to Orifice Eqn when water surface exceeds 1.2*(Outlet Diameter) per Linsley et al. Water Resources Engineering 4th Edition, pg 652.

b) Stage-Storage data obtained from *State Highway Agua Fria Freeway (101L) Agua Fria - (Encanto Blvd. to Camelback Rd.)* , As-built Records, ADOT, 2001.

Appendix D Hydrology Summary Data

Kimley-Horn and Associates, Inc.

Summary of Combination Point Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CBL15	24	1786	1458	-328	24	613	379	-234
CBL35	6	824	824	0	6	415	415	0
CBL43	6	1032	1033	1	6	428	428	0
CBL51	6	948	948	0	24	371	347	-24
CBL59	6	885	795	-90	6	153	117	-36
CBL67	6	149	122	-27	6	22	3	-19
CBL91	24	784	800	16	24	180	180	0
CBL99	24	851	811	-40	24	425	380	-45
CBLLO	24	133	131	-2	24	0	0	0
CBN99	24	1615	1541	-74	24	793	709	-84
CBY07	24	324	140	-184	24	60	0	-60
CBY87	24	919	932	13	24	411	402	-9
CBY91	6	71	77	6	24	0	0	0
CBYAF	6	349	310	-39	24	124	28	-96
CCL57	24	1111	894	-217	24	14	2	-12
CCL67	6	587	467	-120	6	157	50	-107
CCL77	24	800	333	-467	24	134	5	-129
CCLAF	24	1052	978	-74	24	211	130	-81
CCT35	6	692	702	10	6	304	305	1
CCT43	6	1179	1177	-2	24	423	408	-15
CCT51	6	1404	1404	0	24	365	369	4
CDV07	6	244	133	-111	6	56	0	-56
CDV56	24	1088	900	-188	24	163	151	-12
CDV83	6	202	197	-5	6	72	70	-2
CDV87	24	1060	1037	-23	24	508	462	-46
CDV99	24	1291	62	-1229	24	411	0	-411
CDVAF	6	535	NA*	NA*	6	135	NA*	NA*
CDVLP	6	216	39	-177	6	51	0	-51
CDW07	6	823	825	2	6	422	425	3
CDW99	6	589	596	7	6	287	290	3
CGL11	6	274	232	-42	6	65	45	-20
CGL14	24	1006	1056	50	24	409	400	-9
CGLAF	24	1146	1206	60	24	468	457	-11
CGR99	6	1142	1144	2	6	560	561	1
CGW35	6	844	844	0	6	382	382	0
CGW43	6	1294	1296	2	6	449	451	2
CGW51	6	1381	1338	-43	24	467	428	-39
CGW59	24	1474	1387	-87	24	355	345	-10
CGW67	6	820	802	-18	24	134	129	-5
CGW91	24	634	656	22	24	229	235	6
CHV01	24	1067	961	-106	24	237	174	-63
CHV75	24	269	291	22	24	1	0	-1
CHVLP	6	260	241	-19	6	63	41	-22
CHVRS	24	715	380	-335	24	136	5	-131
CILO75	24	672	664	-8	24	264	259	-5
CIUH91	6	509	501	-8	6	199	201	2
CJM67	6	320	343	23	24	2	0	-2
CJMLP	6	675	596	-79	6	1	0	-1
CJMRS	6	394	288	-106	24	1	1	0

Kimley-Horn and Associates, Inc.

Summary of Combination Point Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CLO51	24	1192	998	-194	24	403	400	-3
CLO67	24	1470	1393	-77	24	695	621	-74
CLO75	24	1011	973	-38	24	433	404	-29
CMEAF	24	2220	1771	-449	24	734	673	-61
CNO11	6	1050	1038	-12	24	481	415	-66
CNONR	6	470	409	-61	6	121	62	-59
COL03	24	1434	1372	-62	24	674	649	-25
COLNR	6	401	428	27	24	134	111	-23
CPE35	6	706	703	-3	6	316	317	1
CPE43	6	1242	1228	-14	24	436	436	0
CPP03	6	147	450	303	6	64	61	-3
CPP07	6	179	462	283	6	70	64	-6
CPP73	24	717	572	-145	24	187	105	-82
CPP77	24	855	342	-513	24	152	5	-147
CPP87	24	1189	653	-536	6	258	263	5
CPPLP	24	464	440	-24	6	89	47	-42
CRG07	24	1121	111	-1010	24	255	0	-255
CRG93	6	25	NA*	NA*	24	0	NA*	NA*
CRGAF	24	1225	148	-1077	24	235	18	-217
CRGLP	24	1222	50	-1172	24	378	0	-378
CTB35	6	824	824	0	6	352	352	0
CTB43	6	1232	1233	1	24	398	377	-21
CTB51	6	1367	1350	-17	24	374	355	-19
CTB59	24	1615	1561	-54	24	313	324	11
CTB99	24	2121	2046	-75	24	1066	958	-108
CTL07	6	483	485	2	24	142	128	-14
CUH15	6	827	756	-71	24	295	37	-258
CUH43	6	612	615	3	24	210	211	1
CUH51	24	403	384	-19	24	26	30	4
CUH75	24	209	227	18	24	0	0	0
CUH87	24	1206	1163	-43	24	384	373	-11
CUH91	6	406	409	3	6	198	201	3
CUH99	6	354	358	4	6	180	182	2
CWL59	24	1060	876	-184	24	101	91	-10
CWL67	6	26	26	0	24	0	0	0
CWL75	6	534	419	-115	6	73	43	-30
CWL83	6	122	122	0	6	42	42	0
CWWRS	6	236	237	1	24	1	1	0

Notes:

* These concentration points are not part of the future conditions model because of the construction of the Pinnacle Peak channel.

Kimley-Horn and Associates, Inc.

Summary of Concentration Point Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CBH27	486	485	-1	213	213	0
CBH35	915	915	0	410	413	3
CBH43	728	728	0	270	270	0
CBH51	715	1032	317	293	413	120
CBH59	508	523	15	252	268	16
CBH67	792	810	18	376	392	16
CBH75	799	705	-94	201	212	11
CBH83	634	317	-317	92	0	-92
CBH91	2177	2191	14	686	990	304
CBH99	2574	2520	-54	747	1024	277
CBHLO	2562	2499	-63	742	994	252
CBHNR	2555	2527	-28	737	1016	279
CBHRI	2566	2514	-52	743	1022	279
CCB07	143	134	-9	60	63	3
CCB27	598	596	-2	266	266	0
CCB35	1264	1267	3	561	567	6
CCB43	841	845	4	361	363	2
CCB51	734	734	0	421	421	0
CCB59	1120	1206	86	576	645	69
CCB67	1300	1190	-110	644	494	-150
CCB75	1204	932	-272	551	313	-238
CCB91	681	402	-279	186	51	-135
CCBLO	716	460	-256	208	35	-173
CCBNR	208	203	-5	76	78	2
CCBRI	187	79	-108	23	5	-18
CCT67	801	801	0	336	287	-49
CCT75	1053	1001	-52	354	352	-2
CCT83	1233	1162	-71	313	308	-5
CCTLO	1446	1413	-33	340	327	-13
CGC35	1785	1785	0	769	776	7
CGC43	596	596	0	216	217	1
CGC51	683	646	-37	252	253	1
CGC53	766	706	-60	331	264	-67
CGC55	671	559	-112	203	127	-76
CGC59	683	535	-148	152	128	-24
CGC67	1227	1006	-221	494	275	-219
CGC75	1331	1187	-144	475	467	-8
CGC83	1691	1785	94	663	863	200
CGCGR	1313	1315	2	586	589	3
CGL27	391	393	2	177	176	-1
CGL35	694	699	5	296	294	-2
CGL43	797	797	0	331	331	0
CGL51	828	832	4	265	268	3
CGL59	1063	673	-390	370	251	-119
CGL67	461	461	0	243	243	0
CGL75	707	652	-55	149	129	-20
CGL83	397	369	-28	86	72	-14
CGL91	979	811	-168	184	88	-96
CGLLO	523	375	-148	50	0	-50

Summary of Concentration Point Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CGR27	916	917	1	359	362	3
CGR35	554	556	2	223	228	5
CGR43	690	714	24	308	330	22
CGR59	820	898	78	410	436	26
CGR67	1224	1157	-67	220	226	6
CGR75	820	824	4	198	182	-16
CGR83	927	909	-18	227	228	1
CGR91	544	536	-8	163	134	-29
CGRLO	371	331	-40	61	50	-11
CIBH83	1874	2144	270	669	930	261
CIBHGR	340	447	107	68	91	23
CICB07	203	86	-117	41	44	3
CICB43	179	180	1	74	75	1
CICB75	1595	1571	-24	665	833	168
CICBGR	106	107	1	46	46	0
CIGR35	783	783	0	361	366	5
CIGR43	311	313	2	128	129	1
CIGR59	513	403	-110	66	19	-47
CIGR75	1805	1659	-146	340	336	-4
CIIS35	1771	1771	0	771	779	8
CIN07	6759	6373	-386	3168	2938	-230
CIN35	1224	1225	1	554	555	1
CIN43	1394	1393	-1	611	610	-1
CIN51	693	706	13	400	406	6
CIN59	1487	1485	-2	901	898	-3
CIN67	2127	2120	-7	1379	1366	-13
CIN75	2950	2936	-14	1876	1867	-9
CIN83	3368	3350	-18	2233	2224	-9
CIN91	4117	4086	-31	2670	2610	-60
CINAF	6726	6359	-367	3150	2932	-218
CINAV	6723	6382	-341	3151	2938	-213
CINLO	6735	6326	-409	3180	3037	-143
CIPEGR	508	486	-22	78	38	-40
CIS07	749	837	88	335	461	126
CIS27	701	700	-1	317	317	0
CIS35	1705	1705	0	675	680	5
CIS43	645	645	0	368	368	0
CIS51	769	778	9	194	173	-21
CIS59	1070	918	-152	534	343	-191
CIS83	844	844	0	318	318	0
CIS91	1030	784	-246	351	346	-5
CIS99	240	399	159	98	227	129
CISAF	906	1008	102	389	469	80
CISGC	662	548	-114	249	131	-118
CISLO	1258	864	-394	190	48	-142
CMD07	547	634	87	32	102	70
CMD27	635	635	0	199	202	3
CMD35	1848	1851	3	874	876	2
CMD43	1184	1184	0	492	492	0

Summary of Concentration Point Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CMD51	592	592	0	326	326	0
CMD59	883	877	-6	306	301	-5
CMD67	945	929	-16	348	340	-8
CMD75	1291	1276	-15	380	365	-15
CMD83	1253	1243	-10	430	443	13
CMD91	2252	2215	-37	579	570	-9
CMD99	271	481	210	108	269	161
CMDAF	438	490	52	152	201	49
CMDAV	492	476	-16	41	90	49
CMDLO	2995	2646	-349	541	389	-152
CNO35	597	597	0	310	310	0
CNO43	849	849	0	292	292	0
CNO51	823	827	4	262	265	3
CNO59	1195	1206	11	286	291	5
CNO67	1354	1383	29	303	224	-79
CNO75	1769	1645	-124	325	323	-2
CNO83	899	873	-26	303	125	-178
CNO91	1411	1145	-266	319	109	-210
CNOLO	1137	950	-187	232	98	-134
COL43	422	422	0	195	195	0
COL51	841	843	2	366	368	2
COL59	1121	1123	2	331	331	0
COL67	781	781	0	232	232	0
COL75	957	959	2	191	176	-15
COL83	535	416	-119	245	54	-191
COL91	710	723	13	195	188	-7
COLLO	469	481	12	98	78	-20
COW67	121	131	10	69	79	10
COW75	796	736	-60	149	130	-19
COW83	283	288	5	124	103	-21
CPE59	875	875	0	414	414	0
CPE67	876	862	-14	56	53	-3
CPE75	734	709	-25	313	313	0
CPE83	1093	1042	-51	286	270	-16
CPE91	577	552	-25	244	258	14
CPELO	306	301	-5	61	79	18
CPGL59	451	451	0	420	432	12
CRI07	713	637	-76	225	252	27
CRIAF	329	329	0	189	190	1
CTB75	950	945	-5	441	443	2
CTB83	913	898	-15	343	332	-11
CTBLO	267	258	-9	90	84	-6
CTM07	352	273	-79	100	135	35
CTM27	974	977	3	390	392	2
CTM35	1558	1560	2	690	692	2
CTM43	805	806	1	249	250	1
CTM51	336	316	-20	144	144	0
CTM59	676	576	-100	221	173	-48
CTM67	617	555	-62	260	260	0

Summary of Concentration Point Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
CTM75	884	886	2	369	368	-1
CTM83	1076	1076	0	316	316	0
CTM91	1452	1356	-96	363	361	-2
CTM99	289	551	262	117	308	191
CTMAF	504	474	-30	231	232	1
CTMLO	1577	1143	-434	259	86	-173
CTMRI	413	552	139	193	226	33

Kimley-Horn and Associates, Inc.

Summary of Subbasin Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
83RS	6	981	1021	40	6	471	511	40
AC35	6	747	747	0	6	392	392	0
AC43	6	172	172	0	6	81	81	0
AC51	6	285	284	-1	6	164	164	0
AC59	6	402	403	1	6	225	227	2
AC67	6	397	397	0	6	210	210	0
AC75	6	440	461	21	6	211	226	15
AF11	6	552	650	98	6	300	364	64
BL15	6	730	738	8	24	299	268	-31
BL35	6	859	859	0	6	433	433	0
BL43	6	731	731	0	6	380	380	0
BL51	6	684	684	0	6	329	329	0
BL59	6	756	773	17	6	368	376	8
BL67	6	189	184	-5	6	90	91	1
BL75	6	649	649	0	6	284	284	0
BL91	6	936	947	11	6	490	501	11
BL99	6	916	916	0	6	429	429	0
BLAF	6	89	92	3	6	46	49	3
BLLO	6	585	585	0	6	287	287	0
BLNR	6	537	555	18	6	254	271	17
BN99	6	858	858	0	24	389	345	-44
BY07	6	549	564	15	6	250	262	12
BY87	6	938	938	0	6	464	464	0
BY91	6	575	575	0	6	257	257	0
BYAF	6	401	450	49	6	166	196	30
BYNR	6	787	809	22	24	344	318	-26
CL07	6	412	431	19	6	167	186	19
CL67	6	164	166	2	6	69	71	2
CL77	6	296	288	-8	6	110	116	6
CLAF	6	218	259	41	6	78	113	35
CT35	6	619	618	-1	6	321	324	3
CT43	6	707	707	0	6	367	367	0
CT51	6	669	809	140	6	301	416	115
DV07	6	520	518	-2	6	219	218	-1
DV56	6	410	410	0	6	201	201	0
DV67	6	935	935	0	6	469	469	0
DV75	6	349	349	0	6	156	156	0
DV83	6	81	81	0	6	42	42	0
DV87	6	1142	1142	0	24	511	465	-46
DV99	24	1030	1014	-16	24	390	390	0
DVAF	6	406	411	5	6	161	165	4
DVLP	6	76	81	5	6	32	37	5
DVNR	6	280	280	0	6	125	125	0
DW07	6	325	325	0	6	154	154	0
DW99	6	140	140	0	6	69	69	0
SK67	6	691	704	13	24	288	259	-29
GHAF	6	207	722	515	6	93	398	305
GHNR	6	494	598	104	6	209	281	72
GL03	6	531	605	74	6	246	317	71

Kimley-Horn and Associates, Inc.

Summary of Subbasin Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
GL11	6	409	416	7	6	207	212	5
GL14	6	205	597	392	6	68	332	264
GLAF	6	310	375	65	6	160	205	45
GLGH	6	85	109	24	6	34	62	28
GR99	6	742	742	0	6	431	431	0
GRAF	6	578	593	15	6	277	289	12
GRNR	6	852	978	126	6	374	474	100
GW35	6	679	679	0	6	367	367	0
GW43	6	681	679	-2	6	325	327	2
GW51	6	549	549	0	6	255	255	0
GW59	6	666	673	7	6	339	347	8
GW67	6	665	667	2	6	331	338	7
GW91	6	503	505	2	6	239	241	2
GWLO	6	975	981	6	6	499	503	4
GWNR	6	481	501	20	6	209	224	15
HV01	6	522	562	40	6	246	286	40
HV07	6	449	477	28	6	182	224	42
HV55	24	1404	1267	-137	24	630	522	-108
HV67	6	726	722	-4	6	371	371	0
HV75	6	658	665	7	24	275	240	-35
HV83	6	44	50	6	6	19	25	6
HV87	6	588	593	5	6	294	298	4
HV93	6	235	233	-2	6	108	106	-2
HVAF	6	289	310	21	6	102	145	43
HVLP	6	187	196	9	6	90	96	6
HVNR	6	74	74	0	6	25	25	0
HVRS	6	351	409	58	6	120	171	51
JM75	24	1091	1073	-18	24	444	436	-8
JM76	6	108	118	10	6	36	50	14
JM80	6	147	167	20	6	52	77	25
JM99	6	737	745	8	6	382	396	14
JMAF	6	165	164	-1	6	65	71	6
JMLP	6	744	798	54	6	329	373	44
JMNR	6	54	57	3	6	17	21	4
JMRS	6	510	528	18	6	207	229	22
PEAF	6	674	674	0	6	336	336	0
LO51	6	722	744	22	6	363	377	14
LO67	6	1015	1015	0	24	471	412	-59
LO75	6	825	825	0	6	373	373	0
MEAF	24	1006	1057	51	24	435	456	21
NO07	6	252	249	-3	6	109	109	0
NO11	6	954	968	14	6	465	479	14
NO99	6	385	424	39	6	188	221	33
NOAF	6	153	208	55	6	61	88	27
NONR	6	516	533	17	6	271	295	24
OL03	6	704	704	0	6	329	329	0
OL11	6	275	274	-1	6	117	116	-1
OL99	6	263	265	2	6	114	116	2
OLAF	6	436	500	64	6	190	218	28

Kimley-Horn and Associates, Inc.

Summary of Subbasin Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
OLNR	6	420	428	8	6	225	234	9
PE03	6	244	244	0	6	106	106	0
PE07	6	310	310	0	6	136	136	0
PE11	6	474	474	0	6	254	254	0
PE35	6	526	526	0	6	290	290	0
PE43	6	546	546	0	6	285	285	0
PE97	6	379	384	5	6	164	168	4
PE99	6	120	120	0	6	60	60	0
PENR	6	152	186	34	6	77	98	21
CL57	6	636	663	27	6	270	287	17
PP03	6	147	147	0	6	66	66	0
PP07	6	179	181	2	6	70	73	3
PP67	6	45	45	0	6	16	16	0
PP73	6	405	405	0	6	162	162	0
PP75	6	348	354	6	6	141	156	15
PP77	6	130	125	-5	6	47	48	1
PP81	6	220	220	0	6	90	90	0
PP87	6	1010	1005	-5	24	394	348	-46
PP91	6	94	94	0	6	37	37	0
PPAF	6	541	541	0	6	306	306	0
PPLP	6	434	624	190	6	160	273	113
PPNR	6	94	92	-2	6	34	34	0
JM67	6	359	357	-2	6	163	164	1
JM63	6	783	793	10	6	316	325	9
RG07	6	214	241	27	6	78	109	31
RG93	6	185	185	0	6	81	81	0
RGAF	6	210	210	0	6	84	84	0
RGLP	6	334	320	-14	6	135	151	16
RO99	6	226	226	0	6	115	115	0
TB35	6	617	617	0	6	355	355	0
TB43	6	635	635	0	6	326	326	0
TB51	6	577	577	0	6	276	276	0
TB59	6	625	650	25	6	300	331	31
TB99	6	678	678	0	6	301	301	0
TBNR	6	831	837	6	24	363	321	-42
TL07	6	382	382	0	6	162	162	0
WL67	6	50	50	0	6	18	18	0
UH07	6	109	109	0	6	49	49	0
UH15	6	810	980	170	24	330	420	90
UH35	6	1037	1037	0	6	563	563	0
UH43	6	643	646	3	6	307	309	2
UH51	6	528	532	4	6	275	279	4
UHSK	6	624	646	22	24	256	237	-19
UH75	6	485	485	0	6	278	278	0
UH87	6	1025	1025	0	6	503	503	0
UH91	6	437	437	0	6	225	225	0
UH99	6	386	386	0	6	197	197	0
UHAF	6	174	174	0	6	86	86	0
UHLO	6	758	758	0	6	336	336	0

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Summary of Subbasin Discharges from the Glendale/Peoria Model.

Drainage ID	100-year				10-year			
	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Controling Storm (hr)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
UHNR	6	312	316	4	6	145	148	3
UH97	6	178	178	0	6	77	77	0
UH67	6	589	608	19	6	271	287	16
WL59	6	333	333	0	6	137	137	0
WL75	6	387	387	0	6	167	167	0
WL83	6	112	112	0	6	56	56	0
WLNR	6	283	339	56	6	105	153	48
WWBR	6	329	330	1	6	172	173	1
WWLP	6	302	329	27	6	155	194	39
WWRS	6	147	147	0	6	66	66	0
YLLP	6	546	560	14	6	241	253	12

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Summary of Subbasin Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
BH27	236	236	0	117	117	0
BH35	1040	1035	-5	470	473	3
BH43	499	499	0	264	264	0
BH51	561	561	0	319	319	0
BH59	663	687	24	355	374	19
BH67	530	540	10	285	292	7
BH75	652	663	11	355	376	21
BH83	614	657	43	305	338	33
BH91	589	607	18	307	338	31
BH99	102	120	18	41	65	24
BHLO	918	918	0	518	518	0
BHNR	160	242	82	51	129	78
BHRI	245	395	150	77	213	136
CB07	132	136	4	62	65	3
CB27	235	235	0	117	117	0
CB35	527	527	0	285	285	0
CB43	966	966	0	432	432	0
CB51	889	889	0	505	505	0
CB59	792	876	84	398	466	68
CB67	620	622	2	340	341	1
CB75	591	592	1	332	336	4
CB83	560	560	0	264	264	0
CB91	603	602	-1	237	333	96
CB99	147	154	7	70	85	15
CBLO	570	662	92	238	349	111
CBNR	215	208	-7	79	83	4
CBRI	343	375	32	179	219	40
CT59	297	297	0	148	148	0
CT67	734	726	-8	338	339	1
CT75	637	637	0	337	343	6
CT83	645	645	0	353	353	0
CTLO	553	560	7	293	293	0
GC35	149	149	0	85	85	0
GC43	357	357	0	195	195	0
GC51	221	221	0	123	123	0
GC59	332	332	0	156	156	0
GC67	658	658	0	321	321	0
GC75	196	196	0	116	116	0
GC83	188	191	3	108	112	4
GCGR	980	980	0	608	608	0
GL27	223	223	0	111	111	0
GL35	546	546	0	300	300	0
GL43	639	639	0	348	348	0
GL51	545	548	3	303	306	3
GL59	630	634	4	318	321	3
GL67	461	461	0	243	243	0
GL75	365	364	-1	185	186	1
GL83	338	338	0	155	159	4
GL91	539	566	27	280	316	36
GLLO	531	646	115	206	364	158

Summary of Subbasin Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
GLNR	258	299	41	107	172	65
GR27	626	626	0	347	347	0
GR35	595	594	-1	292	293	1
GR43	575	600	25	276	298	22
GR59	749	754	5	393	395	2
GR67	622	631	9	322	330	8
GR75	620	597	-23	322	320	-2
GR83	554	546	-8	302	301	-1
GR91	596	592	-4	315	315	0
GW83	150	156	6	63	68	5
IN07	269	333	64	139	187	48
IN27	152	152	0	86	86	0
IN35	630	630	0	383	383	0
IN43	522	522	0	292	292	0
IN51	271	283	12	152	160	8
IN59	140	137	-3	74	73	-1
IN67	117	116	-1	62	63	1
IN75	128	136	8	65	71	6
IN83	139	139	0	74	74	0
IN91	201	240	39	111	135	24
INAF	250	358	108	108	170	62
INAV	244	304	60	118	171	53
INLO	141	217	76	73	125	52
IS07	625	642	17	340	353	13
IS27	189	189	0	99	99	0
IS35	1162	1162	0	582	582	0
IS43	859	859	0	486	486	0
IS51	649	727	78	311	363	52
IS59	584	584	0	311	311	0
IS75	553	553	0	280	280	0
IS83	609	609	0	323	323	0
IS91	657	657	0	373	373	0
IS99	240	399	159	98	227	129
ISAF	499	508	9	280	288	8
ISGC	73	73	0	40	40	0
ISLO	515	648	133	234	349	115
MD07	522	542	20	306	314	8
MD27	362	362	0	209	209	0
MD35	793	787	-6	431	429	-2
MD43	1207	1207	0	647	647	0
MD51	606	606	0	355	355	0
MD59	606	606	0	347	347	0
MD67	640	647	7	338	339	1
MD75	655	661	6	359	363	4
MD83	895	1035	140	463	584	121
MD91	675	683	8	377	384	7
MD99	174	301	127	71	168	97
MDAF	337	390	53	167	213	46
MDAV	547	565	18	312	328	16
MDLO	745	749	4	394	400	6

Kimley-Horn and Associates, Inc.

Summary of Subbasin Discharges from the 6-Hour Maryvale Model.

Drainage ID	100-year			10-year		
	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)	Existing Discharge (cfs)	Future Discharge (cfs)	Difference (cfs)
NO27	104	104	0	56	56	0
NO35	577	577	0	313	313	0
NO43	564	564	0	303	303	0
NO51	565	565	0	295	297	2
NO59	626	646	20	327	339	12
NO67	654	659	5	342	366	24
NO75	674	676	2	366	380	14
NO83	748	780	32	357	442	85
NO91	597	624	27	310	348	38
NOLO	263	262	-1	147	146	-1
OL35	199	199	0	101	101	0
OL43	426	426	0	198	198	0
OL51	662	665	3	339	341	2
OL59	675	675	0	361	361	0
OL67	726	726	0	360	360	0
OL75	669	669	0	356	356	0
OL83	586	602	16	293	327	34
OL91	725	735	10	386	392	6
OLLO	168	168	0	95	94	-1
OW67	198	217	19	109	127	18
OW75	518	532	14	269	286	17
OW83	332	335	3	151	167	16
PE51	438	438	0	226	226	0
PE59	708	708	0	360	360	0
PE67	652	654	2	335	336	1
PE75	640	640	0	354	354	0
PE83	659	660	1	383	385	2
PE91	615	627	12	325	335	10
PELO	202	228	26	95	115	20
RI07	534	621	87	218	332	114
RIAF	339	339	0	197	197	0
TB67	335	343	8	168	178	10
TB75	840	832	-8	408	401	-7
TB83	570	570	0	295	295	0
TBLO	85	89	4	47	49	2
TM07	155	154	-1	81	82	1
TM35	630	630	0	363	363	0
TM43	420	420	0	236	236	0
TM51	306	306	0	168	168	0
TM59	383	400	17	184	184	0
TM67	560	560	0	297	297	0
TM75	723	719	-4	380	381	1
TM83	607	607	0	336	336	0
TM91	620	620	0	349	349	0
TM99	294	556	262	120	311	191
TMAF	414	414	0	242	242	0
TMLO	320	560	240	123	311	188
TMRI	404	500	96	191	285	94

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Summary of Subbasin Discharges from the Glendale/Peoria Recommended Plan Models.

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
83RS	511	412
AC35	392	322
AC43	81	64
AC51	164	136
AC59	227	189
AC67	210	176
AC75	226	193
AF11	364	277
BL15	304	268
BL35	433	375
BL43	380	329
BL51	329	288
BL59	376	326
BL67	91	73
BL75	284	253
BL91	501	424
BL99	429	382
BLAF	49	37
BLLO	287	236
BLNR	271	218
BN99	386	345
BY07	262	206
BY87	464	407
BY91	257	195
BYAF	196	158
BYNR	356	318
CL07	186	144
CL67	71	54
CL77	116	87
CLAF	113	85
CT35	324	278
CT43	367	316
CT51	416	352
DV07	218	177
DV56	201	154
DV67	469	357
DV75	156	122
DV83	42	35
DV87	502	465
DV99	394	390
DVAF	165	131
DVLP	37	29
DVNR	125	96
DW07	154	123
DW99	69	55
SK67	296	259
GHAF	398	309
GHNR	281	236
GL03	317	253
GL11	212	164

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
GL14	332	255
GLAF	205	158
GLGH	62	48
GR99	431	379
GRAF	289	244
GRNR	474	410
GW35	367	314
GW43	327	282
GW51	255	228
GW59	347	294
GW67	338	287
GW91	241	190
GWLO	503	419
GWNR	224	183
HV01	286	224
HV07	224	169
HV55	499	522
HV67	371	287
HV75	269	240
HV83	25	19
HV87	298	224
HV93	106	80
HVAF	145	110
HVLP	96	74
HVNR	25	18
HVRS	171	137
JM75	462	436
JM76	50	38
JM80	77	59
JM99	396	322
JMAF	71	56
JMLP	373	313
JMNR	21	16
JMRS	229	184
PEAF	336	258
LO51	377	330
LO67	450	412
LO75	373	329
MEAF	482	456
NO07	109	83
NO11	479	405
NO99	221	190
NOAF	88	63
NONR	295	249
OL03	329	294
OL11	116	88
OL99	116	88
OLAF	218	200
OLNR	234	195
PE03	106	82

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Summary of Subbasin Discharges from the Glendale/Peoria Recommended Plan Models.

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
PE07	136	108
PE11	254	221
PE35	290	250
PE43	285	251
PE97	168	132
PE99	60	48
PENR	98	77
CL57	287	239
PP03	66	50
PP07	73	56
PP67	16	12
PP73	162	126
PP75	156	118
PP77	48	36
PP81	90	73
PP87	364	348
PP91	37	28
PPAF	306	235
PPLP	273	234
PPNR	34	24
JM67	164	125
JM63	325	282
RG07	109	84
RG93	81	63
RGAF	84	68
RGLP	151	116
RO99	115	91
TB35	355	304
TB43	326	285

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
TB51	276	246
TB59	331	286
TB99	301	266
TBNR	357	321
TL07	162	129
WL67	18	14
UH07	49	38
UH15	480	420
UH35	563	486
UH43	309	275
UH51	279	242
UHSK	274	237
UH75	278	235
UH87	503	442
UH91	225	195
UH99	197	161
UHAF	86	62
UHLO	336	290
UHNR	148	115
UH97	77	61
UH67	287	242
WL59	137	107
WL75	167	128
WL83	56	48
WLNR	153	118
WWBR	173	138
WWLP	194	152
WWRS	66	50
YLLP	253	200

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Summary of Combination Point Discharges from the Glendale/Peoria Recommended Plan Models.

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
CBL15	423	379
CBL35	415	374
CBL43	428	381
CBL51	368	347
CBL59	117	127
CBL67	3	6
CBL91	150	180
CBL99	397	380
CBLLO	0	0
CBN99	696	709
CBY07	0	0
CBY87	361	402
CBY91	0	0
CBYAF	23	28
CCL57	0	2
CCL67	50	42
CCL77	0	5
CCLAF	81	130
CCT35	305	278
CCT43	409	408
CCT51	260	369
CDV07	0	0
CDV56	118	151
CDV83	70	57
CDV87	418	462
CDV99	0	0
CDVLP	0	0
CDW07	425	376
CDW99	290	267
CGL11	45	30
CGL14	310	400
CGLAF	404	457
CGR99	561	542
CGW35	382	329
CGW43	451	406
CGW51	412	428
CGW59	311	345
CGW67	83	98
CGW91	193	235
CHV01	146	174
CHV75	0	0
CHVLP	41	34
CHVRS	0	5

Drainage ID	6-Hour Discharge (cfs)	24-Hour Discharge (cfs)
CILO75	238	259
CIUH91	201	194
CJM67	0	0
CJMLP	0	1
CJMRS	0	1
CLO51	369	400
CLO67	625	621
CLO75	366	404
CMEAF	562	673
CNO11	419	415
CNONR	62	82
COL03	619	649
COLNR	111	111
CPE35	317	294
CPE43	424	436
CPP03	61	75
CPP07	64	97
CPP73	66	105
CPP77	0	5
CPP87	263	195
CPPLP	47	33
CRG07	0	0
CRGAF	8	18
CRGLP	0	0
CTB35	352	314
CTB43	398	377
CTB51	327	355
CTB59	283	324
CTB99	901	958
CTL07	139	128
CUH15	48	37
CUH43	207	211
CUH51	16	30
CUH75	0	0
CUH87	291	373
CUH91	201	194
CUH99	182	161
CWL59	52	91
CWL67	0	0
CWL75	43	39
CWL83	42	36
CWWRS	0	1

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Summary of Concentration Point Discharges from the Maryvale Recommended Plan Models.

Drainage ID	6-hour Discharge (cfs)	24-hour Discharge (cfs)
CBH27	213	157
CBH35	413	402
CBH43	270	233
CBH51	413	391
CBH59	266	277
CBH67	266	260
CBH75	28	42
CBH83	0	0
CBH91	1061	1241
CBH99	1153	1352
CBHLO	1118	1315
CBHNR	1113	1344
CBHRI	1134	1351
CCB07	63	48
CCB27	266	210
CCB35	567	562
CCB43	363	369
CCB51	421	378
CCB59	553	507
CCB67	299	285
CCB75	255	269
CCB91	51	35
CCBLO	17	30
CCBNR	78	61
CCBRI	5	7
CCT67	287	257
CCT75	352	306
CCT83	308	304
CCTLO	327	317
CGC35	644	557
CGC43	402	350
CGC51	294	284
CGC53	265	267
CGC55	127	119
CGC59	82	68
CGC67	268	265
CGC75	441	468
CGC83	834	907
CGCGR	470	487
CGL27	176	140
CGL35	294	255
CGL43	331	292
CGL51	268	255
CGL59	251	262
CGL67	243	184
CGL75	71	89
CGL83	67	94
CGL91	43	134
CGLLO	0	11
CGR27	255	269
CGR35	228	219
CGR43	333	341

Drainage ID	6-hour Discharge (cfs)	24-hour Discharge (cfs)
CGR59	278	294
CGR67	226	248
CGR75	172	163
CGR83	215	234
CGR91	134	120
CGRLO	50	40
CIBH83	970	1110
CIBHGR	0	0
CICB07	44	33
CICB43	75	68
CICB75	770	813
CICBGR	46	36
CIGR35	245	240
CIGR43	129	121
CIGR59	19	18
CIGR75	68	102
CIIS35	648	555
CIN07	2993	3309
CIN35	491	457
CIN43	639	689
CIN51	412	356
CIN59	905	868
CIN67	1375	1355
CIN75	1880	1883
CIN83	2237	2239
CIN91	2630	2685
CIN95	166	80
CINAF	2984	3307
CINAV	2990	3314
CINLO	3098	3273
CIPEGR	38	32
CIS07	461	406
CIS27	317	257
CIS35	680	665
CIS43	368	363
CIS51	177	196
CIS59	287	265
CIS83	318	272
CIS91	346	310
CIS99	227	172
CISAF	469	428
CISGC	113	97
CISLO	48	31
CMD07	102	96
CMD27	151	160
CMD35	778	776
CMD43	492	547
CMD51	326	295
CMD59	301	289
CMD67	340	304
CMD75	365	357
CMD83	443	434

Drainage ID	6-hour Discharge (cfs)	24-hour Discharge (cfs)
CMD91	570	627
CMD99	269	214
CMDAF	201	176
CMDAV	90	82
CMDLO	389	469
CNO35	310	265
CNO43	292	256
CNO51	267	250
CNO59	293	282
CNO67	105	136
CNO75	251	274
CNO83	47	105
CNO91	229	242
CNOLO	122	228
COL43	195	156
COL51	331	284
COL59	374	317
COL67	257	214
COL75	179	196
COL83	54	47
COL91	188	204
COLLO	115	142
COW67	79	94
COW75	68	96
COW83	103	94
CPE59	348	301
CPE67	30	15
CPE75	313	294
CPE83	270	280
CPE91	258	256
CPELO	79	99
CPGL59	290	305
CRI07	252	208
CRIAF	190	158
CTB75	443	363
CTB83	332	283
CTBLO	84	57
CTM07	135	116
CTM27	350	326
CTM35	571	558
CTM43	358	299
CTM51	144	131
CTM59	149	145
CTM67	260	242
CTM75	368	321
CTM83	316	283
CTM91	361	327
CTM99	308	240
CTMAF	232	199
CTMLO	86	75
CTMRI	226	152

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Summary of Subbasin Discharges from the Maryvale Recommended Plan Models.

Drainage ID	6-hour Discharge (cfs)	24-hour Discharge (cfs)
BH27	117	88
BH35	473	404
BH43	264	222
BH51	319	267
BH59	374	280
BH67	292	244
BH75	376	314
BH83	338	282
BH91	338	284
BH99	65	51
BHLO	518	412
BHNR	129	99
BHRI	213	165
CB07	65	49
CB27	117	89
CB35	285	239
CB43	432	369
CB51	505	379
CB59	466	381
CB67	341	284
CB75	336	281
CB83	264	211
CB91	333	279
CB99	85	66
CBLO	349	282
CBNR	83	61
CBRI	219	176
CT59	148	116
CT67	339	285
CT75	343	290
CT83	353	297
CTLO	293	239
GC35	85	64
GC43	195	149
GC51	123	94
GC59	156	120
GC67	321	267
GC75	116	92
GC83	112	89
GCGR	608	457
GL27	111	86
GL35	300	254
GL43	348	290
GL51	306	256
GL59	321	267
GL67	243	184
GL75	186	147
GL83	159	125
GL91	316	264
GLLO	364	291
GLNR	172	134
GR27	347	264
GR35	293	221
GR43	298	224
GR59	395	297
GR67	330	251
GR75	320	245
GR83	301	230
GR91	315	246
GW83	68	51
IN07	187	142
IN27	86	65
IN35	383	292
IN43	292	225
IN51	160	121
IN59	73	58
IN67	63	51
IN75	71	55
IN83	74	57
IN91	135	103
INAF	170	130
INAV	171	130
INLO	125	95
IS07	353	295
IS27	99	77
IS35	582	502
IS43	486	365
IS51	363	298
IS59	311	260
IS75	280	222
IS83	323	270
IS91	373	312
IS99	227	172
ISAF	288	239
ISGC	40	32
ISLO	349	277
MD07	314	255
MD27	209	158
MD35	429	352
MD43	647	552
MD51	355	296
MD59	347	291
MD67	339	283
MD75	363	302
MD83	584	477
MD91	384	319
MD99	168	129
MDAF	213	175
MDAV	328	272
MDLO	400	319
NO27	56	43
NO35	313	264
NO43	303	256
NO51	297	251
NO59	339	283
NO67	366	302
NO75	380	287
NO83	442	358
NO91	348	291
NOLO	146	112
OL35	101	77
OL43	198	156
OL51	341	284
OL59	361	302
OL67	360	300
OL75	356	298
OL83	327	254
OL91	392	326
OLLO	94	72
OW67	127	96
OW75	286	219
OW83	167	131
PE51	226	175
PE59	360	302
PE67	336	279
PE75	354	296
PE83	385	323
PE91	335	258
PELO	115	88
RI07	332	267
RIAF	197	157
TB67	178	138
TB75	401	339
TB83	295	250
TBLO	49	38
TM07	82	66
TM35	363	274
TM43	236	189
TM51	168	132
TM59	184	146
TM67	297	243
TM75	381	317
TM83	336	281
TM91	349	291
TM99	311	236
TMAF	242	196
TMLO	311	236
TMRI	285	218

Appendix E Cost Estimate Data and Flooding Issues

Engineer's Opinion of Probable Cost
Summary

Alternative	Cost
55th Avenue between Union Hills and the ACDC	
Storm drain in 55th Avenue	$ 2,950,000
ACDC access at Thunderbird and 59th Avenue	
Storm drain to ACDC	$ 1,200,000
67th Avenue and Arrowhead Hospital	
Storm drain to Sack Drive and 67th Avenue	$ 390,000
51st Avenue North of Olive Avenue	
Storm drain to Sack Drive and 67th Avenue	$ 5,970,000
51st Avenue between Northern and Olive	
Storm drain along 51st Avenue from Olive Avenue to North of Peoria Avenue	$ 1,720,000
55th Avenue between Northern and Olive	
Storm drain with Retention basin	$ 2,900,000
59th Avenue between Northern and Olive	
Storm drain with in-line Detention basin	$ 4,010,000
Maryland Lakes and Rose Lane Park	
Connect to ADOT Basin at 43rd Avenue	$ 2,650,000
Glendale Avenue between 51st and 59th Avenue	
Storm Drain in Glenn Drive	$ 4,310,000
59th Avenue between Camelback Road and Bethany Home Road	
Storm drain	$ 1,630,000
67th Avenue between Camelback Rd and Bethany Home	
Storm drain	$ 1,570,000
71st Avenue north of Camelback	
Storm drain	$ 1,240,000
Camelback Road and 91st Avenue	
Detention/retention basin	$ 4,950,000
Storm Drains in Arterial Street	
Storm Drains	$ 83,000,000
Storm Drains in Collector Streets	
Storm Drains	$ 63,000,000
Grand Avenue between Glendale Avenue and Northern Avenue	
Enlarge inlets	$ 450,000
Beardsley Road and 55th Avenue (Drainage Problem #285)	
Inlet with storm drain across 55th Avenue	$ 60,000
Inlet at 61st Avenue and Basin at Sahuaro Ranch Park	
Curb cut	$ 40,000
Amphitheatre at Glendale City Hall	

Engineer's Opinion of Probable Cost
Alternative 3.1

55th Avenue from Union Hills to the ACDC

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$50,000	$50,000.00
2	Mobilization	1	LSUM	$20,000	$20,000.00
3	Water Management	1	LSUM	$4,000	$4,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	8,402	SYD	$35	$294,070.00
6	Remove Concrete Curb	750	LF	$7	$5,250.00
7	Concrete Sidewalk	3,000	SF	$4	$12,000.00
8	Concrete Catch Basin, L=12-ft	50	EA	$3,200	$160,000.00
9	Construct Storm Drain Manhole	28	EA	$7,000	$196,000.00
10	36" Storm Sewer Pipe	2,715	LF	$150	$407,250.00
11	48" Storm Sewer Pipe	3,594	LF	$200	$718,800.00
12	54" Storm Sewer Pipe	3,852	LF	$220	$847,440.00
13	66" Storm Sewer Pipe	0	LF	$300	$0.00
14	24" Storm Sewer Pipe	1,220	LF	$110	$134,200.00
15	Connect to Existing 48" Storm Drain	1	EA	$4,000	$4,000.00
16	Connect to Existing 54" Storm Drain	1	EA	$4,500	$4,500.00
17	Relocate Existing Water Main (Vertical)	1	EA	$2,000	$2,000.00
				Subtotal	**$2,864,510.00**
	Design/Const./Project Management		30%		$40,260.00
	Utilities		10%		$13,420.00
	Contingency		25%		$33,550.00
				Total	**$2,951,740.00**

Engineer's Opinion of Probable Cost
Alternative 3.2

ACDC Access at 59th Avenue South of Thunderbird Road

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$40,000	$40,000.00
2	Mobilization	1	LSUM	$25,000	$25,000.00
3	Water Management	1	LSUM	$3,000	$3,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	1,644	SYD	$35	$57,540.00
6	Construct Concrete Inlet Structure	1	EA	$25,000	$25,000.00
7	Single Barrel 8' x 4' Box Culvert	470	LF	$1,200	$564,000.00
8	Construct Concrete Outfall Structure	1	EA	$5,000	$5,000.00
				Subtotal	$724,540.00
	Design/Const./Project Management		30%		$217,362.00
	Utilities		10%		$72,454.00
	Contingency		25%		$181,135.00
				Total	**$1,195,491.00**

Engineer's Opinion of Probable Cost
Alternative 3.3

Storm drain 67th Avenue and Arrowhead Hospital

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$15,000	$15,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$3,000	$3,000.00
4	Permitting	1	LSUM	$3,000	$3,000.00
5	Sawcut, Remove and Replace A.C. Pavement	631	SYD	$35	$22,085.00
6	Remove Concrete Curb	90	LF	$7	$630.00
7	Concrete Sidewalk	360	SF	$4	$1,440.00
8	Concrete Catch Basin, L=12-ft	6	EA	$3,200	$19,200.00
9	24" Storm Sewer Pipe	1,391	LF	$110	$153,010.00
10	Connect to Existing 24" Storm Drain	1	EA	$2,500	$2,500.00
				Subtotal	$234,865.00
	DCM Project Management		30%		$70,459.50
	Utilities		10%		$23,486.50
	Contingency		25%		$58,716.25
				Total	**$387,527.25**

Engineer's Opinion of Probable Cost
Alternative 3.4

Storm drain along 51st Avenue from Olive Avenue to North of Peoria Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$50,000	$50,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	10,529	SYD	$35	$368,515.00
6	Remove Concrete Curb	540	LF	$7	$3,780.00
7	Concrete Sidewalk	2,160	SF	$4	$8,640.00
8	Concrete Catch Basin, L=12-ft	36	EA	$3,200	$115,200.00
9	Construct Storm Drain Manhole	18	EA	$7,000	$126,000.00
10	36" Storm Sewer Pipe	110	LF	$150	$16,500.00
11	54" Storm Sewer Pipe	5,165	LF	$220	$1,136,300.00
12	60" Storm Sewer Pipe	2,628	LF	$260	$683,280.00
13	66" Storm Sewer Pipe	2,456	LF	$300	$736,800.00
14	24" Storm Sewer Pipe	1,221	LF	$110	$134,310.00
15	Connect to Existing 66" Storm Drain	1	EA	$5,000	$5,000.00
				Subtotal	$3,409,325.00
	Design/Const./Project Management		30%		$1,022,797.50
	Utilities		20%		$681,865.00
	Contingency		25%		$852,331.25
				Total	**$5,966,318.75**

Engineer's Opinion of Probable Cost
Alternative 3.5

Storm drain from Northern Avenue to Barbara Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$20,000	$20,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	2,885	SYD	$35	$100,975.00
6	Remove Concrete Curb	240	LF	$7	$1,680.00
7	Concrete Sidewalk	960	SF	$4	$3,840.00
8	Concrete Catch Basin, L=12-ft	16	EA	$3,200	$51,200.00
9	Construct Storm Drain Manhole	5	EA	$7,000	$35,000.00
10	42" Storm Sewer Pipe	2,536	LF	$180	$456,480.00
11	36" Storm Sewer Pipe	1,374	LF	$150	$206,100.00
12	24" Storm Sewer Pipe	547	LF	$110	$60,170.00
13	Connect to Existing 42" Storm Drain	1	EA	$3,500	$3,500.00
	Relocate Existing Water Main (Vertical)	10	EA	$2,000	$20,000.00
				Subtotal	$983,945.00
	Design/Const./Project Management		30%		$295,183.50
	Utilities		20%		$196,789.00
	Contingency		25%		$245,986.25
				Total	**$1,721,903.75**

Engineer's Opinion of Probable Cost
Alternative 3.6

Regional Detention Basin at Golf Course

Item	$40,000.00	Qty	Unit	Unit Price	Cost
	Traffic Control	1	LSUM	$20,000	$20,000.00
	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	3,364	SYD	$35	$117,740.00
6	Remove Concrete Curb	180	LF	$7	$1,260.00
7	Concrete Sidewalk	720	SF	$4	$2,880.00
8	Concrete Catch Basin, L=12-ft	12	EA	$3,200	$38,400.00
9	Construct Storm Drain Manhole	11	EA	$7,000	$77,000.00
10	36" Storm Sewer Pipe	100	LF	$150	$15,000.00
11	42" Storm Sewer Pipe	2,199	LF	$180	$395,820.00
12	54" Storm Sewer Pipe	1,800	LF	$220	$396,000.00
13	24" Storm Sewer Pipe	289	LF	$110	$31,790.00
14	Grading for Detention Basin	63,000	CYD	$10	$630,000.00
15	Relocate Existing Water Main (Vertical)	2	EA	$2,000	$4,000.00
				Subtotal	$1,754,890.00
	Design/Const./Project Management		30%		$526,467.00
	Utilities		10%		$175,489.00
	Contingency		25%		$438,722.50
				Total	**$2,895,568.50**

Engineer's Opinion of Probable Cost
Alternative 3.7

Storm drain with in-line detention basin

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$20,000	$20,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	3,993	SYD	$35	$139,755.00
6	Remove Concrete Curb	195	LF	$7	$1,365.00
7	Concrete Sidewalk	780	SF	$4	$3,120.00
8	Concrete Catch Basin, L=12-ft	13	EA	$3,200	$41,600.00
9	Construct Storm Drain Manhole	10	EA	$7,000	$70,000.00
10	Construct Concrete Bubble Up Structure	1	EA	$10,000	$10,000.00
11	42" Storm Sewer Pipe	1,392	LF	$180	$250,560.00
12	72" Storm Sewer Pipe	2,482	LF	$330	$819,060.00
13	24" Storm Sewer Pipe	448	LF	$110	$49,280.00
14	Connect to Existing 42" Storm Drain	1	EA	$3,500	$3,500.00
15	Grading for Detention Basin	24,200	CYD	$10	$242,000.00
	Relocate Existing Water Main (Vertical)				
				Subtotal	$1,675,240.00
	Land Acquisition	138,700	SF	$9	$1,248,300.00
	Design/Const./Project Management		30%		$502,572.00
	Utilities		10%		$167,524.00
	Contingency		25%		$418,810.00
				Total	**$4,012,446.00**

Engineer's Opinion of Probable Cost
Alternative 3.8

Connect to ADOT Basin at 43rd Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$60,000	$60,000.00
2	Mobilization	1	LSUM	$40,000	$40,000.00
3	Water Management	1	LSUM	$4,000	$4,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	2,716	SYD	$35	$95,060.00
6	Construct Storm Drain Manhole	16	EA	$7,000	$112,000.00
7	36" Storm Sewer Pipe	1,243	LF	$150	$186,450.00
8	48" Storm Sewer Pipe	2,597	LF	$200	$519,400.00
9	Grading for Detention Basin	25,813	CYD	$10	$258,130.00
10	Concrete Inlet or Outlet Headwall	5	EA	$5,000	$25,000.00
11	Construct Concrete Inlet Structure	1	EA	$10,000	$10,000.00
12	Relocate Existing Water Main (Vertical)	3	EA	$2,000	$6,000.00
				Subtotal	$1,321,040.00
	Land Acquisition	200,000	SF	$2	$400,000.00
	Design/Const./Project Management		30%		$396,312.00
	Utilities		15%		$198,156.00
	Contingency		25%		$330,260.00
				Total	**$2,645,768.00**

Engineer's Opinion of Probable Cost
Alternative 3.9

Storm Drain in Glenn Drive

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$50,000	$50,000.00
2	Mobilization	1	LSUM	$40,000	$40,000.00
3	Water Management	1	LSUM	$4,000	$4,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	6,411	SYD	$35	$224,385.00
6	Remove Concrete Curb	585	LF	$7	$4,095.00
7	Concrete Sidewalk	2,340	SF	$4	$9,360.00
8	Concrete Catch Basin, L=12-ft	39	EA	$3,200	$124,800.00
9	Construct Storm Drain Manhole	20	EA	$7,000	$140,000.00
10	36" Storm Sewer Pipe	400	LF	$150	$60,000.00
11	78" Storm Sewer Pipe	4,586	LF	$350	$1,605,100.00
12	24" Storm Sewer Pipe	786	LF	$110	$86,460.00
13	Connect to Existing 78" Storm Drain	1	EA	$5,500	$5,500.00
14	Relocate Existing Water Main (Vertical)	12	EA	$2,000	$24,000.00
15	Sanitary Sewer Conflict	8	EA	$10,000	$80,000.00
				Subtotal	$2,462,700.00
	Design/Const./Project Management		30%		$738,810.00
	Utilities		20%		$492,540.00
	Contingency		25%		$615,675.00
				Total	**$4,309,725.00**

Engineer's Opinion of Probable Cost
Alternative 3.10

Storm Drain in 59th Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$50,000	$50,000.00
2	Mobilization	1	LSUM	$30,000	$30,000.00
3	Water Management	1	LSUM	$4,000	$4,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	2,798	SYD	$35	$97,930.00
6	Remove Concrete Curb	180	LF	$7	$1,260.00
7	Concrete Sidewalk	720	SF	$4	$2,880.00
8	Concrete Catch Basin, L=12-ft	12	EA	$3,200	$38,400.00
9	Construct Storm Drain Manhole	8	EA	$7,000	$56,000.00
10	36" Storm Sewer Pipe	2,595	LF	$150	$389,250.00
11	48" Storm Sewer Pipe	1,284	LF	$200	$256,800.00
12	24" Storm Sewer Pipe	393	LF	$110	$43,230.00
13	Connect to Existing 78" Storm Drain	1	EA	$5,500	$5,500.00
14	Relocate Existing Water Main (Vertical)	3	EA	$2,000	$6,000.00
				Subtotal	$986,250.00
	Design/Const./Project Management		30%		$295,875.00
	Utilities		10%		$98,625.00
	Contingency		25%		$246,562.50
				Total	**$1,627,312.50**

Engineer's Opinion of Probable Cost
Alternative 3.11

Storm drain from Camelback Road to Bethany Home Road

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$30,000	$30,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Sawcut, Remove and Replace A.C. Pavement	2,652	SYD	$35	$92,820.00
6	Remove Concrete Curb	180	LF	$7	$1,260.00
7	Concrete Sidewalk	720	SF	$4	$2,880.00
8	Concrete Catch Basin, L=12-ft	12	EA	$3,200	$38,400.00
9	Construct Storm Drain Manhole	7	EA	$7,000	$49,000.00
10	36" Storm Sewer Pipe	100	LF	$150	$15,000.00
11	48" Storm Sewer Pipe	1,800	LF	$200	$360,000.00
12	60" Storm Sewer Pipe	975	LF	$260	$253,500.00
13	24" Storm Sewer Pipe	366	LF	$110	$40,260.00
14	Connect to Existing 60" Storm Drain	1	EA	$4,800	$4,800.00
15	Relocate Existing Water Main (Vertical)	6	EA	$2,000	$12,000.00
				Subtotal	$924,920.00
	Design/Const./Project Management		30%		$277,476.00
	Utilities		15%		$138,738.00
	Contingency		25%		$231,230.00
				Total	**$1,572,364.00**

Engineer's Opinion of Probable Cost
Alternative 3.12

Storm drain from Camelback Road to Missouri Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$15,000	$15,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$3,000	$3,000.00
4	Permitting	1	LSUM	$3,000	$3,000.00
5	Sawcut, Remove and Replace A.C. Pavement	2,065	SYD	$35	$72,275.00
6	Remove Concrete Curb	270	LF	$7	$1,890.00
7	Concrete Sidewalk	1,080	SF	$4	$4,320.00
8	Concrete Catch Basin, L=12-ft	18	EA	$3,200	$57,600.00
9	Construct Storm Drain Manhole	6	EA	$7,000	$42,000.00
10	36" Storm Sewer Pipe	100	LF	$150	$15,000.00
11	48" Storm Sewer Pipe	2,265	LF	$200	$453,000.00
12	24" Storm Sewer Pipe	395	LF	$110	$43,450.00
13	Connect to Existing 48" Storm Drain	1	EA	$4,000	$4,000.00
				Subtotal	$729,535.00
	Design/Const./Project Management		30%		$218,860.50
	Utilities		15%		$109,430.25
	Contingency		25%		$182,383.75
				Total	**$1,240,209.50**

Engineer's Opinion of Probable Cost
Alternative 3.13

Detention Basin/Retention Basin

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$20,000	$20,000.00
2	Mobilization	1	LSUM	$15,000	$15,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Concrete Scupper	4	EA	$3,000	$12,000.00
6	Grading for Detention Basin	58,100	CYD	$10	$581,000.00
			Construction Subtotal		$638,000.00
	Land Acquisition	557,000	SF	$7	$3,899,000.00
	Design/Const./Project Management		30%		$191,400.00
	Utilities		10%		$63,800.00
	Contingency		25%		$159,500.00
				Total	**$4,951,700.00**

Engineer's Opinion of Probable Cost
Alternative 4.1

Enlarge Inlets along Grand Avenue between Glendale Avenue and Northern Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$30,000	$30,000.00
2	Mobilization	1	LSUM	$20,000	$20,000.00
3	Water Management	1	LSUM	$5,000	$5,000.00
4	Permitting	1	LSUM	$5,000	$5,000.00
5	Remove Existing Concrete Catch Basin	13	EA	$800	$10,400.00
6	Remove Concrete Curb	210	LF	$5	$1,050.00
7	Concrete Catch Basin, L=12-ft	14	EA	$4,500	$63,000.00
8	Connect to Existing 108" Storm Drain	14	EA	$10,000	$140,000.00
				Subtotal	$274,450.00
	Design/Const./Project Management		30%		$82,335.00
	Utilities		10%		$27,445.00
	Contingency		25%		$68,612.50
				Total	**$452,842.50**

Engineer's Opinion of Probable Cost
Alternative 4.2

Valley Gutter Across 55th Avenue

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$2,000	$2,000.00
2	Mobilization	1	LSUM	$5,000	$5,000.00
3	Water Management	1	LSUM	$2,000	$2,000.00
4	Permitting	1	LSUM	$4,000	$4,000.00
5	Sawcut, Remove and Replace A.C. Pavement	795	SYD	$30	$23,850.00
6	Concrete Valley Gutter	500	SF	$10	$5,000.00
				Subtotal	$36,850.00
	Design/Const./Project Management		30%		$11,055.00
	Utilities		10%		$3,685.00
	Contingency		25%		$9,212.50
				Total	**$60,802.50**

Engineer's Opinion of Probable Cost
Alternative 4.6

Curb Cut

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$3,000	$3,000.00
2	Mobilization	1	LSUM	$5,000	$5,000.00
3	Water Management	1	LSUM	$2,000	$2,000.00
4	Permitting	1	LSUM	$4,000	$4,000.00
5	Remove Concrete Curb	30	LF	$7	$210.00
6	Concrete Apron	1,365	SF	$7	$9,555.00
				Subtotal	$23,765.00
	Design/Const./Project Management		30%		$7,129.50
	Utilities		10%		$2,376.50
	Contingency		25%		$5,941.25
				Total	**$39,212.25**

Engineer's Opinion of Probable Cost
Alternative 4.7

Connect Pump to New Storm Drain in Glenn Drive

Item	$40,000.00	Qty	Unit	Unit Price	Cost
1	Traffic Control	1	LSUM	$8,000	$8,000.00
2	Mobilization	1	LSUM	$5,000	$5,000.00
3	Water Management	1	LSUM	$2,000	$2,000.00
4	Permitting	1	LSUM	$4,000	$4,000.00
5	78" Storm Sewer Pipe	430	LF	$350	$150,500.00
6	New Pump	1	EA	$70,000	$70,000.00
7	Force Main (DI Pipe 8")	305	LF	$40	$12,200.00
8	Connect to Existing 78" Storm Drain	1	EA	$7,500	$7,500.00
9	Concrete Catch Basin, L=12-ft	3	EA	$3,200	$9,600.00
10	Construct Storm Drain Manhole	2	EA	$7,000	$14,000.00
				Subtotal	$282,800.00
	Design/Const./Project Management		30%		$84,840.00
	Utilities		10%		$28,280.00
	Contingency		25%		$70,700.00
				Total	**$466,620.00**

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
1	18213 N 68th Ave	MRS WILLIAM GARLING	INDICATED THAT NEIGHBORS IN ARROWHEAD ESTATES, ARROWHEAD RANCH, AND ARROWHEAD VALLEY HAVE BEEN WAITING FOR 11 YEARS FOR THE CITY TO BUILD A CULVERT AT 67TH AND SKUNK CREEK		Yes	Yes	Street project should have solved problem also
3	55TH AVE @ NORTHERN AVE	MRS SMIDT	THE WATER STREAMS DOWN ACCESS ROAD AND FLOODED OUT HER PATIO AND YARD 5526 W NORTHERN		No	Yes	Problem will be solved with completion of Northern Storm Drain.
4	5850 W MONTE CRISTO	QUENTINE VOWELL		PAID BY CONTRACTORS INSURANCE	Yes	Yes	59th Ave. Storm drain should also have solved problem.
5	5915 W REDFIELD	GEORGE ONIMETTE			No	Yes	Should be solved by 59th Ave. Storm Drain
6	6604 W MARY JANE LANE LN	FLORENCE MAUMOFF			No	Yes	Should be solved by 67th Ave. Storm Drain & Improvements at school
8	6810 N 59TH DR	ROBERT CIENEROT			No	Yes	Should be solved by Grand Improvements. Not sure what problem is.
9	7006 N 76TH DR	JACK WILLIAMS	INSIDE OF HOUSE FLOODED DAMAGE TO CARPET AND DAMAGE TO STRUCTURE		No	maybe	Don't know for sure
10	43RD AVE @ PEORIA AVE	DAN (MANAGER), TARGET	PARKING LOT FLOODS EVERY TIME IT RAINS HE WANTED TO KNOW IF THEY CAN BUILD A PERMANENT DRAIN PIPE TO PUMP WATER TO STREET	I EXPLAINED TO HIM THAT PARKING LOT WAS DESIGNED TO RETAIN WATER AND THAT HE NEEDS TO CHECK DRY WELL I TOLD HIM TO SUBMIT REQUEST IN WRITING TO CITY ENGINEER IF HE WANTS TO DRAIN INTO STREET (1/19/88)	Yes	Yes	ACDC should have helped solve problem as well as the reconstruction of store and parking lot.
11	4950 W BETHANY HOME RD	MR BARBER	IRRIGATION DISTRIBUTION BOX AT 49TH AVE & ROSE LANE BUBBLES OUT EVERY TIME IT RAINS AND FLOODS TRAILER PARK	LOOKED AT PROBLEM IN THE FIELD WITH JOE CAZARES THE BOX COULD BE BUILT UP TO PREVENT BUBBLING EFFECT	No	maybe	Sounds like a SRP problem
12	8638 W CAVALIER	BOB PENDERGAST	BACKYARD FLOODS DUE TO OVERFLOW FROM TAIL WATER DITCH BEHIND PROPERTY	FIELD INSPECTION 1/22/88 CONVEYED TO COMM DEV VIA LETTER 1/25/89 RESPONSE TO OWNER 1/29/88 VIA PHONE AND 2/1/88 VIA LETTER	Yes	Yes	His own problem
13	5002 N 65TH AVE	DONNA STOCKTON	FRONT YARD FLOODS EVERY TIME IT RAINS STREET DRAIN GRATE EASILY PLUGS UP AND STOPS DRAINING	FIELD INSPECTION 1/29/88 RELAYED TO OWNER THAT WE WOULD TRY TO BUDGET NEXT FY FOR A LARGER CB 2/01/88 CATCH BASIN CONSTRUCTED IN DEC 1988	Yes	Yes	Solved in 1988
14	18214 N 67 AVE	ANITA JORDAN	STREET DRAINS INTO FRONT YARD, NO CURB ALONG PROPERTY	FIELD INSPECTION 1/29/88 ASKED INPUT FROM STREETS DEPT 1/29/88 MET WITH OWNER 3/10/88 SURVEYED STREET ON 3/11/88 BERM CONSTRUCTED BY CITY FORCES 4/15/88 OWNER CONTACTED 4/18 AND WAS SATISFIED WITH SOLUTION	Yes	Yes	Solved in 1988
15	8303 N 56TH AVE	MRS MAZZA	NUISANCE AND STORM WATER PUDDLE ON THE APRON AND BREED MOSQUITOES	MET WITH MRS MAZZA 4/5/88	No	Yes	Olive Drain should eliminate some water, overlay and curb reconstruction should solve local problem.
16	16041 N 66TH DR	DAVID GILES	WATER FLOODS HIS PROPERTY DURING HEAVY RAINS	VISITED THE SITE 5/6/88 ALONG WITH DAN PERNA AND FOUND THAT CITY FORCES HAD ALREADY BUILT A BERM TO DIVERT THE WATER REVIEW OF TOPO MAP INDICATES THAT EXISTING SWALE HAS POSITIVE DRAINAGE	Yes	Yes	Solved in 1988
17	7433 W READE	HOLLIS WEBB	WATER FLOODED SEVERAL HOUSES IN THE AREA, INCLUDING HIS HOUSE FURNITURE AND CARPET WERE DAMAGED THE NEIGHBORS WANT A SOLUTION	MET WITH MR WEBB AND THE NEIGHBORS AND WALKED DOWN THE AREA WITH GRANT ON 8/22/88 PROVIDED INTERIM AND PERMANENT SOLUTION RECOMMENDATION TO GRANT 8/25/88	No	Yes	Construction of BH Outfall Channel and storm drain improvements at 75th Avenue will allow street to drain.
18	82ND AVE @ MARYLAND	RETENTION BASIN	RETENTION BASIN OVERFLOW FLOODED HOUSE IMMEDIATELY NORTH OF THE BASIN	VISITED THE SITE WITH GRANT ON 8/22/88	Yes	Yes	Maryland street improvements completed and believe outfall across Maryland to another basin was constructed.
19	16209 N 67 AVE	JUSTIN SMITH	NO CURB & GUTTER ALONG EAST SIDE OF 67 AVE NORTH OF PARADISE LANE PROPERTY AT NE CORNER OF 67 & PARADISE LANE FLOODS DURING HEAVY RAINS SWALE AND CULVERTS ALONG EAST SIDE OF ROAD HAVE BEEN DESTROYED AND WORSENED FLOW RESTRICTIONS	CONTACTED LARRY VASSEL ON 3/9/89 SOLUTION IS TO RE-GRADE SHOULDER TO ALLOW FOR POSITIVE DRAINAGE TO AN EXISTING HEADWALL AND REMOVE DEBRIS TO ELIMINATE OBSTRUCTIONS RELYED SOLUTION TO MR SMITH ON 4/3/89 GRADING WORK COMPLETED	Yes	Yes	Street improvements have been made.
20	5002 N 65 AVE	MARTIN COLE	STORM WATER BUILDS UP AT NW CORNER OF 65 AVE & CAMELBACK CATCH BASIN AT END OF FRONTAGE ROAD CANOT DRAIN THE AMOUNT OF WATER DRAINING TO THAT CORNER	MR COLE WAS TOLD THAT THE CITY RECENTLY RECONSTRUCTED THE CATCH BASIN TO IMPROVE THE DRAINAGE AS MUCH AS POSSIBLE, YET THE CAPACITY OF THE DRAINAGE PIPE IS LIMITING THE ABILITY TO DISPOSE OF THE WATER THE CITY WILL NOT BE ABLE TO IMPROVE DRAINAGE IN T	Yes	No	Construction of Camelback SD and 67th Ave SD in future will resolve the problem.

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21	8618 N 56TH DR	ROSEANNA LOCKHART	WATER BUILDS UP IN STREET FROM RUNOFF ON 55 & 59 AVES GOING INTO BUTLER PARK AND OVERFLOWING RET BASIN PROBLEM OCCURS 2-3 X'S A YR WATER DRAINS OUT IN 2-3 HRS DUE TO NEW DRYWELLS BUILT IN BUTLER PARK PROBLEM FROM CARS DRIVING BY CREATE WASH WHI	CH GETS INTO HOUSES OWNERS WOULD LIKE TO BLOCK STREET DURING HIGH WATER SOLUTION: PROBLEMS APPEARS TO BE WATER VOLUME IS TOO LARGE TO FIT THROUGH THE ENTRANCE INTO THE CONCRETE CHANNEL DAVE KOHNERT IS TO GET AS-BUILT SURVEY TO CHECK ON PROBLEM	No	Yes	The Olive Drain and impovements to outlet should have solved problem.
22	51ST AVE @ PURDUE	MRS HOWARD	MAJOR PROBLEM W/WATER ENTERING PROPERTY FROM 51 AVE HER PROPERTY IS LOW AND ONCE THE WATER GETS IN IT DOESN'T LEAVE UNTIL EVAPORATES THEY HAVE HAD TO USE SAND BAGS TO KEEP WATER OUT OF THE HOUSE HER INS CO SUGGESTS SUEING THE CITY BUT SHE DOESN'T		No	No	Can't solve the low property but construction of a storm drain in 51st Avenue should solve problem
23	47TH AVE @ ROSE LN	UNKNOWN	THERE IS A DRAINAGE PROBLEM @ 47TH AND ROSE LANE PROBLEM HAS GONE ON FOR YEARS PERSON DID NOT LEAVE NAME	FORM ID TO IMPROVE 47TH AVE ALSO COULD BUILD A STORM DRAIN TO ROSE LANE PARK WHEN THEY CALL BACK ASK ABOUT AN ID	No	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
24	4648 W CAVALIER	MR & MRS ANDERSON	WATER ENTERS THEIR PROPERTY OFF OF 47TH AND FLOODS THEIR POOL & BACK YARD WATER LINES INDICATE WATER WAS WITHIN 1" OF ENTERING HOUSE PROBLEM HAPPENS 1-2 TIMES A YR MOST OF THE DAMAGE IS THE RESULT OF WAVES CREATED BY CARS BURTON DET BAS DIDN'T HELP	THEY WERE HOPING THE CITY WOULD HELP OWNER TO THE N HAS BSEMENT WHICH NORMALLY FLOODS BUT NOT KNOW IF FLOODED THURSDAY SOLUTION: THEY MAY ELIMINATE THE GATE AND BLOCK A CROSS OPENING WHICH SHOULD KEEP WATER OUT TALKED TO HER ABOUT AN ID FOR W PROPERT	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
25	8020 N 57TH DR	CHUCK PETERSON	LARGE VOLUME OF WATER IN 57 DR FLOODS HIS PROPERTY AND SEVERAL NEIGHBORS WATER YESTERDAY CAME IN OFF THE ALLEY INTO HIS BACK YARD THIS HAS HEPPENED SEVERAL TIMES IN THE 9 YRS HE HAS LIVED THERE	TOLD HIM OLIVE AVE DRAIN FROM 51-59 IS TO BE BUILT IN A COUPLE OF YRS WHICH SHOULD HELP ALSO WANT TO USE PARKS FOR RET BASINS	No	Yes	Olive Drain should have solved problem. Storm drain in 55th Avenue from the Northern Ave. SD in the future will totally resolve problem.
26	8322 N 55TH AVE	SANDRA TOMLIN	WATER IS 1"-2" DEEP IN 55TH WHICH PUTS 2' OF WATER IN FRONT & BACK YARDS THE WATER ALMOST CAME INTO THEIR HOUSE ALSO HAVE A LARGE SRP ELEC BOX IN THEIR BACK YARD WHICH SHE WORRIES ABOUT WENT OUT TO THE SITE TO SEE & THERE IS EVIDENCE OF 2'+ OF WATE	CONST STORM DRAIN AND RET BASINS TO INTERCEPT WATER BEFORE IT GETS TO THE HOUSE	Yes	Yes	Olive Drain should have solved problem. Storm drain in 55th Avenue from the Northern Ave. SD in the future will totally resolve problem.
27	15620 N 71ST AVE	LAVONNE BECKER	GRENADA ESTATES DEV WATER UNDERNEATH HOME TOOK OUT PLUMBING AND THEYHAD TO PUMP IT OUT THE DRAIN INTO THE CANAL IS TOO SMALL STREET IS UNDERMINED AND SHOULD HAVE THE CURB BROKEN OUT	BROKE OUT CURB 8-13, 8-14 GOT CALL THE PROBLEM WAS IN BACK DUE TO BERM PUT IN ACROSS ENDS OF 4 STREETS CHECK STREETS DESIGN LARGER CURB OPENING AND CHANNEL FCDMC WILL FIX	Yes	Yes	The openings were enlarged and ditch improved.
28	17836 N 70TH DR	MRS PAT NORMAN	STORM DRAIN 6 IN FROM FLOODING HOUSE PROBLEM IS THE BASIN AT THE DITCH WHICH HOLDS THE WATER CALLED AGAIN 8-14 PROBLEM IS THERE ISN'T ANY OUTLET FOR THE STORM WATER	IMPROVE DITCH TO SKUNK CREEK THERE DOESN'T SEEM TO BE MUCH THAT CAN BE DONE TO SOLVE PROBLEM	No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
29	4520 W COCHISE	KEN HAMPTON	FLOODING PROBLEM DUE TO DEVELOPMENT WANTS TO KNOW IF WE WERE AWARE OF PROBLEM WHEN WE ALLOWED BUILDING? PROPERTIES TO NORTH HAVE YARDS WHICH DRAIN TO SOUTH THROUGH YARDS ALL YARDS HAVE BLOCK FENCES WHICH BLOCK WATER HOUSES 1-2' ABOVE STREET	NONE	Yes	No	
30	5240 W BERYL	GRANT HINDERER	1 BLK S OF PEORIA - APT COMPLEX RETENTION BASIN OVERFLOW INTO HIS YARD	THE BASIN WOULD BE 2-4' DEEP BEFORE GETTING TO BOTTOM OF WALL WHICH IS ON THEIR BACK YARD THERE ARE SOME HOLES IN DIRT WHICH MAY HAVE SOME WATER FLOW THROUGH ONLY PROBLEM IS LARGER VOLUME OF WATER PHONE NUMBERS - W:264-6831 H:931-6969	Yes	No	Would need to do a field check to see if basins are large enough.
31	5503 W SUNNYSIDE DR	PAT FERRARI	THE STREET DOESN'T SEEM TO DRAIN EXCEPT FOR TO THEIR HOUSE SOMEBODY HAS BUILT A LARGE BASIN ON OTHER SIDE OF STREET	STREET GRADES ARE FLAT THERE ARE 2 BASINS ON N SIDE OF STREET WHICH OUTLET VIA SCUPPERS INTO SUNNYSIDE DIRT GETS INTO STREET FROM BASINS AND 1/2 STREET IMP OF 55TH AVE N OF SUNNYSIDE NO ACTION	Yes	Yes	Prior solution
32	5625 W ORCHID LN	FRANCIS HERNANDEZ	THE WATER COULDN'T GET INTO THE BASIN AND THEIR HOUSE FLOODED SAT & SUNDAY WATER AT THE TOPS OF THE BOLLARDS IN CHANNEL THIS IS A MAJOR PROBLEM	ENLARGE BUTLER DET BASIN AND PROVIDE LARGER OPENINGS TO GET WATER INTO BASIN	No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
33	5827 W EVERGREEN	NICHOLAS BENSFIELD	WATER ON PROPERTY WHICH RUNS OUT OF THE BUTLER PARK BASIN AND CROSSES THROUGH FIELDS	IMPROVE SITUATION AT BUTLER WHICH WILL HELP HERE STREET AT 57 AND EVERGREEN NEEDS TO BE FIXED	No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
34	5832 W EVERGREEN	SEE HIROSE	WATER ENTERED ONTO THE PROPERTY AND ENTERED THE HOUSE THE WATER COMESFROM THE BUTLER RET BASIN	IMPROVE BASIN AT BUTLER AND FIX STREET 57TH & EVERGREEN	No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
35	6606 W EVA ST	ALICE WESLEY	WANTS TO KNOW WHO IS GOING TO CLEAN UP THE MESS FROM FLOODING THEY ARE ELDERLY AND CAN'T	CONTACT STREETS ABOUT CLEANING MUD OUT OF EVA @ 67TH GAVE INFO TO VASSEL	Yes	Yes	Prior solution

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36	67TH AVE @ BUTLER	MARK MCFADDEN	MANAGER-ORANGEWOOD MOBILE HOME PARK WATER IN 67TH & BUTLER HE WANTS TO KNOW WHAT HE CAN DO TO SOLVE FLOODING PROBLEM LOTS OF PROPERTY DAMAGE AND DAMAGE TO BUILDINGS	CHECK IN FIELD AND ADVISE	No	Yes	Storm drain in 67th was completed.
37	7033 N 67TH AVE	MUI NGUYEN	FLOODING ON THE PROPERTY FROM THE STORM	CALLED AGAIN 10-25-90	No	Yes	Orangewood SD should reduce the total flow and street improvements to 67th Ave. should have also reduced the flow into the property.
38	7044 W NANCY RD	MR WILKENSON	TALKED TO KAREN - FLOODED OUT TRAILER COURT WATER INTO THE BASEMENT UNDER THE TRAILER AND UNDER MOBILE HOME	OPEN CURB TO ALLOW DRAINAGE PROVIDE IMPROVED DRAINAGE AN OUTLET THE FCDMC WILL FIX	Yes	Yes	Channels were improved and openings were enlarged into channels.
39	8021 N 58TH AVE	DWAYNE NELSON	COMING DOWN ALLEY - WATER DRAINS DOWN ALLEY INTO HIS YARD FILLED POOLWATER COMES UP AND BACK UP FROM NORTHERN AFTER FLOW IN NORTHERN GOES DOWN THE PROBLEM GOES AWAY BUT STILL PUTS ALL THE MUD ETC IN HIS YARD	TOLD HIM HE COULD CONSTRUCT BERM OR BLOCK WALL ACROSS THE ALLEY FRONTAGE TOLD HIM I WOULD LOOK AT IT AND GET BACK TO HIM (PHONE NUMBERS W-937-3542; H-934-3672)	No	Yes	Think construction of the subdivision instead of the farm at Min's Farm should have helped resolve problem. Olive Ave. SD should reduce the total amount of water to area.
40	8208 N 59 DR	CHUCK PETERSON	WATER FROM STORM IS FLOODING HIS PROPERTY HE SAYS THERE IS A LACK OF DRAINAGE		No	No	Northern Ave. SD and future drain in 59th Avenue will resolve drainage problem. Olive Ave. SD should have helped situation.
41	15616 N 71ST AVE	BRENDA LIMAS	71ST & GREENWAY TRAILER - 3' FROM FLOODING BOTTOM OF TRAILER THE DITCH IN BACK OF PROPERTY ON THE 4 STREETS NORTH OF PROPERTY	CHECK PROBLEM IN FIELD TO SEE IF IT CAN BE SOLVED IMPROVE DRAINAGE AT GREENWAY AND DITCH TO ACDC CHECK OUT DEAD END STREETS FCDMC WILLFIX	Yes	Yes	Resolved by FCDMC and improved drainage openings.
42	4913 W CITRUS WAY	AMELIA SALINAS	CALLED IN TO RSK MGMT		No	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
43	5554 W ORCHID LN	MARK BROWN	DAMAGE TO PROPERTY CALLED IN TO RISK MGMT		No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
44	5607 W ORCHID LN	WILLIAM MURRAY	CALLED IN TO RSK MGMT		No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
45	5613 W ORCHID LN	CARL LARSON	FLOOD DAMAGE CALLED INTO RSK MGMT He called in again on 10-15-90		No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
46	5619 W ORCHID LN	BILL ROBBINS	CALLED IN TO RSK MGMT		No	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
47	6102 W CHERYL DR	SAM PIGNATO	COMPLAINT IS THAT EVERY TIME IT RAINS WATER COMES DOWN 61ST AVENUE FROM THE WATER RETENTION AREA AND FLOODS HIS AREA IT USUALLY RUNS OFF SO FAST THAT THE SEWER CAN'T HANDLE IT. HE WOULD LIKE SOMEONE IN THE CITY TO TAKE A LOOK AT THIS	`	No	No	Need to improve drainage access to basin.
48	67TH AVE @ CAMELBACK	SONNY/JOHN (EXXON STA)	TRASH FROM STREET FLOODING KEEPS WASHING UP ON PROPERTY CITY IN PAST HAS UNCLOGGED STREET AND WATER GOES DOWN WANTS TO LET US KNOW IT IS HAPPENING AGAIN	GAVE INTO TO VASSEL TO CLEAN GRATES	Yes	No	Construction of Camelback SD and 67th Ave SD in future will resolve the problem.
49	7219 N 47TH AVE	FRIEDA GREEN	CALLED IN TO RSK MGMT		No	No	Not sure of problem.
50	8002 N 57TH AVE	NASEEB ZALIBA	4' OF WATER INSIDE THEIR HOUSE THEY WANT TO KNOW WHAT CAN BE DONE TO PROTECT THEIR HOUSE NEIGHBOR CONSTRUCTED A FENCE WHICH BLOCKS WATER & KEEPS IT IN HIS YARD WONDERS IF THE CITY CAN BUILD A WALL AROUND HIS PLACE WITH GATES TO KEEP OUT WATER OR	BUY HIM FLOOD INSURANCE NO SOLUTION	No	Yes	The Northern Ave. SD will resolve problem.
51	8609 N 56TH DR	RICK HOGAN	CALLED IN TO RSK MGMT		No	Yes	Not sure of problem. Olive Ave. SD should have resolved problem.
52	4857 W MARLETTE AVE	MICHELE & BARB DOWNIE	WANTS TO KNOW ABOUT WHAT COULD BE DONE WITH THE BURTON DETENTION BASIN TOLD HIM WE WERE TRYING TO GET IT LANDSCAPED BUT THE RAINS WERE PREVENTING IT	LANDSCAPE BASIN	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
53	5035 W GLENN DR	RAYMOND LARDIE	WATER RUNNING INTO THEIR PROPERTY AND FLOODED OUT 3 ROOMS NO DRAINS IN THE STREET WATER RUNS DOWN THE STREET FROM BUSINESSES FLOOD IRRIGATED YARD & LOWER THAN CURB NO PIPES IN AREA	THE BUSINESSES ACROSS STREET IS HIGHER BUT DRAINS TOWARDS CENTER OF PROPERTY WHICH IS LOW OVERFLOWED TO GLENN DRIVE & FLOODED HOUSE CONSTRUCT BERM OR WALL IS ALL THAT CAN BE DONE	Yes	Yes	Prior solution
54	53RD AVE @ CACTUS RD	KAREN HOPPER	EMPTY FIELD OWNER PUT IN A TRENCH ALONG THE WALLS AT THEIR PROPERTY THE WATER CONCENTRATES ALONG HER WALL AND FLOODS POOLS ALSO UNDERMANED HER WALL	TOLD HER TO CONTACT OWNER AND SEE WHAT HE CAN DO TO FIX HER PROBLEM SHE WILL GO TO COUNTY RECORDER TO GET OWNER'S NAME	Yes	No	Private issue. Future SD in Cactus will totally resolve problem.
55	59TH AVE @ MARY JANE LN	CHARLENE NOACK	WATER STARTING TO COME INTO HER GARAGE	DRAIN WATER OUT @ GREENWAY INTO NEW ST DRAIN SHOULD SOLVE AND HELP PROBLEM	Yes	Yes	59th Ave. Storm drain should also have solved problem.
56	59TH AVE @ GREENWAY RD	PAT CHUMBLEY	SAID THERE WAS A PROBLEM @ 59 & GREENWAY TOLD HER WE WERE BUILDING A STORM DRAIN IN 59TH WHICH WILL SOLVE PROBLEMS IN THE FUTURE OPENED THE DRAIN TO HELP SITUATION NOW	NONE REQUIRED 8-15-90 2:55 PM	Yes	Yes	59th Ave. Storm drain should also have solved problem.

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57	59TH AVE @ MONTE CRISTO	JOY CLAY	CALLED ABOUT WATER FROM WALMART ON 59&BELL IS FLOODING PARADISE LANE AND MONTE CRISTO	CALLED AND TOLD ANSWERING MACHINE THAT WE WERE DRAINING STREET @ 59TH& GREENWAY WHICH SHOULD HELP HER PROBLEM	Yes	Yes	59th Ave. Storm drain should also have solved problem.
58	6007 W BEVERLY LN	JOHN EAGER	FLOODING FROM 15 ACRES OF LAND ONTO HIS YARD WATER 59 & PARADISE ON WSIDE THE WIDENING OF 59 AVE & STORM DRAIN THE WATER COLLECTS IN VAC-ANT LOT AND DRAINS TO S/W TO PARADISE WATER RUNS ALONG BLOCK WALL TO A DAM WHICH OVERTOPS AND WASHES MUD ONTO	PROPERTY THE WATER USED TO RUN DOWN 59TH BUT CAN'T NOW DUE TO WIDEN-ING SOLUTION: DRAINING 59 & GREENWAY NEW PIPE SHOULD SOLVE PROBLEM	Yes	Yes	59th Ave. Storm drain should also have solved problem.
59	6206 W BELL RD	PHYLLIS VOLLMER	5-6" OF WATER IN PARK LOT DUE TO OTHERS PUMPING WATER INTO LOT THEY MAY HAVE PATIENTS GOING THRU LOT - LIABILITY, NORMALLY DON'T HAVE DRAINAGE PROBLEM AND DIDN'T HAVE A PROBLEM THIS AM UNTIL OTHERS STARTED PUMPING THEIR WATER	CALLED 11:30 AM 8-15-90 I TOLD HER THAT OTHERS ALONG BELL ARE PUMPING OUT LOTS NOW IN BETWEEN RAINS TO MAKE CAPACITY FOR ADD RAINFALL THE WATER COMING INTO THEIR AREA COULD ALSO BE PUMPED OUT BUT THAT IT WOULD BE UP TO HER TO DO IT AS FAR AS WATER SE	Yes	maybe	Private issue. Large volume of rain created problem and there is no real solution other than storm drain in Bell Rd. to solve it.
60	6501 N 47TH AVE	JOSEPH WIRTZ	WANTED TO COMPLAIN ABOUT THE BURTON RETENTION BASIN	FIX THE BASIN	Yes	No	The basin needs to have a positive outfall.
61	67TH AVE @ BEARDSLEY RD	DOICE HUBBARD	WATER RUNS ALONG CURB ON BEARDSLEY & 67TH AND ENTERS PROPERTY AND FILLS PARKING AREA NEEDS TO BE PUMPED OUT AND MADE TO PASS THROUGH INTER-SECTION THINKS HIS DRIVEWAY HAS COLLAPSED	TOLD HIM TO CALL VASSEL TO ARRANGE PUMPS SHOULD TALK TO BOB FLYNN	Yes	Yes	The ADOT drain and Loop 101 should have solved the problem.
62	73TH AVE @ OCOTILLO	MR GUTIERREZ	WATER FROM OPEN TO NORTH IS COLLECTED IN TAIL WATER DITCH WHICH HAS BEEN FILLED BY SWIMMING POOL PEOPLE AND NOW RUNS OFF FIELDS ONTO STREETTHINKS PROBLEM COULD BE SOLVED IF DITCH OPENED BACK UP THINKS WE NEEDTO FIX SITUATION	THE WATER IS NATURAL DRAINAGE AND NOT THE DITCH WHAT DITCH THERE IS,IT'S MORE OF A BERM THAN DITCH NO ADDITIONAL RESPONCE NECESSARY	Yes	No	Private issue. Future SD in Glendale will resolve problem.
63	75TH AVE @ CAMELBACK RD	MR PERNATIS	WANTS TO KNOW ABOUT WHAT CAN BE DONE ABOUT THE FLOODING AT 75TH & CAMELBACK TOLD HIM ABOUT STREET PROJECT AND THE DEAL WITH PHOENIX ON EXTENDING THE PIPE TO CAMELBACK	DRAINAGE IN THE AREA	Yes	Yes	The BH Outfall channel and future Camelback Drain will totally solve problem.
64	8328 N 55TH AVE	MR DAWS	TIRED OF WATER IN THE STREETS ETC THINKS THE CITY PLANNERS DO A BAD JOB AND WANTS MINS FARM TO BE USED AS DRAINAGE SO THE WATER WON'T GET ON HIS PLACE TOLD HIM WE WERE WORKING ON GETTING DRAINAGE IN THE AREA BUT NOTHING YET	DRAINS IN THE STREET	Yes	Yes	Olive Ave. SD has reduced water. Northern Ave. SD and future drain in 55th will resolve problem.
65	8809 N NEW WORLD DR	BILLYJO PHILLIPS	WATER WENT INTO THE HOUSES WOULD IT BE POSSIBLE TO HAVE AN ENGINEER TO TALK TO THE ASSOCIATION OF THE TOWNHOUSES?	GAVE HER MAPS ETC, SHOWING DRAINAGE SHE WILL RESPOND TO COMPLAINT FROM OWNERS AND SEE WHAT HAPPENS	Yes	Yes	Olive Ave. SD should have resolved problem.
66	4332 W GRAND AVE	MADHU BHAKTH	43 & CAMELBACK GETS WATER FROM GRAND & 43 WATER FROM STREETS IS A PROBLEM TOLD HIM ADOT IS GRAND & PHOENIX IS 43 AND GAVE HIM PHONE NO'S FOR BOTH	REFERRED HIM TO PHX AND ADOT	Yes	Yes	ADOT has resolved drainage at this intersection.
67	54TH AVE @ GLENDALE AVE	MR COURY	54TH AVE ABANDONED RAILROAD TRESSEL IS CAUSING FLOODING IN THE BUILDINGS IN THE AREA NEAR THE NEW CHOCOLATE FACTORY THE R/R IS ABANDONEDWHEN GLENDALE AVE WAS IMPROVED THEY RAISED GLENDALE WHICH ELIMINATED ALL THE FREEBOARD SO STREET IS HIGHER THAN GR	REMOVE THE TRACKS OR HAVE PARTS LOWERED 6" OR SO, SO IT IS LOWER THAN FLOOR ELEVATIONS SO WATER WILL GO DOWN LAMAR	No	Yes	Revised grades to provide drainage.
68	6020 W BELL RD	MIKE SINGER	THEIR PROPERTY WAS FLOODED DUE TO THE WATER COMING IN OFF OF A WALL ON THEIR PROPERTY LINE WANTS SOMEBODY TO CHECK ON WHY WALL WAS SCREWED UP BOB FLYNN AND RANDY SPRITZER WERE THERE AND TOLD HIM THE WALL WAS BUILT WRONG	TOLD HIM THE WALL WAS A PROBLEM BETWEEN PROPERTY OWNERS	Yes	No	Private issue.
69	66TH LN @ SKUNK CREEK	MS SHELLEY	66TH LANE BACKS UP TO 67TH AVE NEXT TO SKUNK CREEK CLOSE TO BEING FLOODED THINKS THE MAINTENANCE OF SKUNK CREEK THINKS THERE IS GOING TO BE A MAJOR PROBLEM	SHE WANTS SKUNK CREEK CLEANED	Yes	Yes	Skunk Creek was channelized to contain 100-year flows.
70	7841 N 51 AVE	DR BRIAN CARDER	AN APT COMPLEX WAS CONSTRUCTED S OF HIM AND THE BLOCK WALL IS CAUSING WATER TO STAND ABOUT 1' DEEP ON HIS PROPERTY	THERE IS A PRESCHOOL @7831 BETWEEN HIM AND APTS THE APTS ARE HIGHER THAN THE DR OR PS BUT IT LOOKS LIKE IT WOULD BE DITCHED TO THE STREET WITH LITTLE WORK ALL WORK WOULD NEED TO BE BY HAND IT APPEARS THE OWNER HAS DUG A DITCH ADJACENT TO THE WALL TO	No	Yes	The Northern Ave. SD will resolve problem.
71	5120 N W GRAND AVE	KARI ROVALA	WANTS TO KNOW IF THE CITY SHOULDN'T HAVE DRYWELLS IN THE AREA?		No	maybe	ADOT improvements to intersection should mitigate flooding. BH Rd SD required to solve problem.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
72	6515 N 83RD AVE	BILL SMITH	DET BASIN FILLED UP MARYLAND WAS BUILT HIGH CAUSING A DIKE 83RD IS ALSO BUILT UP MAKING ANOTHER DAM-LIKE CONDITION	DAN, SEE IF MARYLAND/83RD HAS ALTERED DRAINAGE PATTERNS	No	Yes	Maryland street improvements completed and believe outfall across Maryland to another basin was constructed.
73	6418 N 46TH DR	BECKY BRIDGMAN	RETENTION BASIN AT 47TH AND MARYLAND Wants to know what is going to be done to make it not so ugly Told her we were working on the landscaping contract and should have it done soon	Landscape basin	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
74	4601 W ROSE LN	MRS WILKINS	THE BURTON BASIN IS AN EYE SORE AND HAZARD PART OF THE PROBLEM IS THE TRAFFIC WHICH CREATES WAVES ETC TOLD HER ABOUT THE LANDSCAPE CONTRACT AND WE WERE LOOKING INTO THE TRAFFIC ISSUES SHE THINKS THERE COULD BE AN ARTICLE IN THE CONNECTION TO TELL	FINISH BURTON	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
75	5317 W WESCOTT	NEIL COLLINS	WANTS TO KNOW WHEN IMPROVEMENTS WILL BE MADE IE: STORM DRAIN WATER WASHES OUT ALL OF HIS DG WANTS TO KNOW WHEN STREETS WILL BE IMPROVED		No	No	No street improvements planned.
76	8159 W SIERRA VISTA DR	CAROLINE NYHUS	THE RETENTION BASIN FILLS UP AND FLOODS SEVERAL PROPERTIES PART OF THE PROBLEM IS A BROKEN IRRIG DITCH WHICH FILLS THE BASIN PART WAY EVEN WHEN NOT RAININGDITCH IS @ 78-79 & MARYLAND TWO HOUSES @ 83RD & MARYLAND FLOOD W/DAMAGE THE REST HAD PROPERTY DA	THIS IS ALL PART OF THE PROBLEM FOR PARKER ETC	Yes	Yes	Maryland street improvements completed and believe outfall across Maryland to another basin was constructed.
77	4918 W PUGET	BERNADETTE DOBBS	BERNADETTE WOULD LIKE ENG TO REGRADE HER CORNER LOT AT 49 AND OLIVE	LAWN IS LOWER THAN STREET BY SEVERAL INCHES	No	Yes	Olive Ave. SD should have resolved issue.
78	5959 W ORANGEWOOD	PAT BAILEY	INS WOULD NOT PAY FOR DAMAGE WATER WAS IN HOUSE THE SAT FLOOD GOT INTO HER HOUSE SHE SOESN'T HAVE FLOOD INS HEARD THAT HER MORTGAGE CO WOULD GET THE INS TO HELP PAY WANTED TO KNOW WHAT I THOUGHT ABOUT IT TOLD HER WORTH A TRY	NONE REQUIRED	Yes	Yes	The storm drain in Orangewood was connected to Grand Ave. SD and should resolve the issue.
79	7118 N 53RD AVE	JOHN M JAHNKE	WATER COMES IN FROM THE MOBIL HOME PARK AT 51ST & ORANGEWOOD WHICH DIRECTS ALL THE WATER TO HIS PLACE A LARGE HOLE WAS CREATED IN HIS YARD UNDER HIS DRIVEWAY WANTS DG FROM THE CITY	TOLD HIM ABOUT DIRT AT 47TH & GLENDALE WHICH BILL HUDSON SUPPLIED	Yes	Yes	Prior solution
80	7412 N 71ST AVE	JAMES A FORD	SWC-71 & ORANGEWOOD WATER FLOWS DOWN 67TH TO ORANGEWOOD THEN GOES WEST TO 71ST & DOWN PAST AND THROUGH HIS HOUSE ALWAYS HAD A MINOR PROBLEM BUT 4 YEARS AGO THE PROBLEM BECAME WORSE		No	Yes	Orangewood SD should have resolved the problem.
81	4468 GRAND AVE	ELMER WAHL	LIBERTY CAR SALES (ADJACENT PROPERTY) CHANGED THEIR LANDSCAPE HIS HOUSE NOW FLOODSHAS LIVED THERE 30 YEARS AND HAS NEVER HAD PROBLEM BEFORE SAID DRAINAGE HAS BEEN BLOCKEDALSO SAYS SOMEBODY ELSE HAS CONNECTED TO HIS WATER METER		Yes	Yes	ADOT has resolved drainage issues.
82	4637 W MARLETTE AVE	BETTY TAYLOR	WANTS TO COMPLAIN ABOUT THE BURTON BASIN TOLD HER THERE WAS A LANDSCAPE CONTRACTOR ALREADY UNDER CONTRACT THAT COULDN'T WORK BECAUSE OF THE RAIN	FINISH BASIN	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
84	4511 WEST LOMA LN	SITORSTI	WATER IN HOUSE AND A LOT OF DAMAGE TO PROPERTY AND LANDSCAPING (THEY ARE IN THEIR 80'S AND NOT ABLE TO DO REPAIRS OR CLEAN UP)	CALLED AND GAVE KIT CARLSON'S NUMBER FOR ASSISTANCE	Yes	Yes	The Northern Ave. SD will resolve problem.
85	4608 W MARYLAND AVE	KELLY GAVAGAN	FLOODED IN HOUSE, AND DAMAGE TO WALLS	EXPLAINED WHAT WE ARE DOING WITH RETENTION BASIN TOLD HER IT MAY NOT SOLVE HER PROBLEM, BUT IT SHOULD HELP	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
86	5112 W CAROL	PAT ELLIOTT	GARDEN HOMES (FIVE IN A ROW) PASEO PLACE) SHE CALLED AGAIN ON 10-29 TO DISCUSS WHERE THE WATER CAME FROM AND WHAT COULD BE DONE TO SOLVE IT SHE WILL GET TOGETHER WITH JIM FROM HER HOME OWNER ASSOC AND FIND OUT WHAT HE HAS COME UP WITH TOLD HER THE		No	No	Future SD in 51st Ave. will resolve problem.
87	5134 W VOGEL	LAURA ANDERSON	HOUSE IS FLOODED AND THEY NEED HELP BADLY IT'S HER MOTHER'S HOUSE AND SHE HAS NO INSURANGE AN CANNOT FIND HELP		No	No	Future SD in 51st Ave. will resolve problem.
88	6020 WEST PARADISE LN	DON TALARELLI	FLOODING WASHED AWAY HIS LANDSCAPING TOLD HIM STORM DRAIN IN 59TH AVENUE SHOULD HELP NEEDS TO TALK TO NEIGHBOR ON THE WATER FROM HIS PROPERTY	CLEAN STREETS	Yes	Yes	59th Ave. Storm drain should also have solved problem.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
89	6186 WEST HEARN	JOHN ROSS	MUD ON ROAD AND EROSION OF STREET, AND PART OF HIS HOME HAZARDOUS AND DANGEROUS	STREET NEEDED TO BE CLEANED	Yes	Yes	59th Ave. Storm drain should also have solved problem.
90	7849 W FLYNN	HERBERT	SAID HE WAS TOLD HIS HOUSE WAS THE CATCH BASIN FOR 2 HOUSES NEXT TO HIM AND THAT HE IS GETTING FLOODED		No	No	Orangewood SD should have helped but future SD in Glendale is needed to resolve the issue.
91	10607 N 65TH AVE	LAURA SMITH	(STREETS)		Yes	No	Future SD in Peoria Ave. will resolve problem.
92	14653 N 64TH	LEONARD HUDSON	THE WATER BACKS UP IN THEIR CULL-DE-SAC FROM 63RD AND HAS NO PLACE TO GO THEY BROKE A HOLE THROUGH THE WALL TO LET THE WATER DRAIN TO ACDC THE OPENING NEEDS TO BE ENLARGED AND FIXED PERMANENTLY	THE OPENINGS NEED TO BE ENLARGED TO ACDC FOR THE ENTIRE STRETCH BETWEEN 59TH AND 67TH AND BEYOND	No	Yes	Believe the hole was enlarged or something else done to resolve the problem.
93	15279 N 64TH DR	BOUDLE	FLOOD BECAUSE OF SLOPE TO YARD		No	No	Don't know for sure. Greenway SD will resolve issue.
94	15453 N 66TH AVE	RALPH JOHNSON	FLOODING 2-3 FEET DEEP BY GRADE SCHOOL AT 63 AVE N OF CACTUS		No	Yes	Think it means Greenway Road and Cactus Grade School. Drainage channel next to HS was improved to help drain water to Greenway.
95	15601 N 66TH AVE	BYRAN STANLEY	THE SCHOOL FIELD AND THEIR YARD HAD 4'-5' OF WATER IN HOUSE	CALLED 9-5-90 NEED TO GO OUT AND LOOK AT IT CHECK OUT DITCH ON W SIDE OF CACTUS SCHOOL ALSO ALONG GREENWAY CAN IT BE MADE LARGER AND CLEANED OUT?	No	Yes	Think it means Greenway Road and Cactus Grade School. Drainage channel next to HS was improved to help drain water to Greenway.
96	16209 N 60TH AVE	FRANK MORENO	FLOODING IN BACK YARD	TOLD HER IT WAS A PROBLEM BETWEEN HER AND HER NEIGHBORTHE STORM DRAIN IN 59TH AVENUE SHOULD HELP WHEN COMPLETED, BUT STILL HAS A MONTH OR TWO TO GO	Yes	Yes	59th Ave. Storm drain should also have solved problem.
97	18402 N 70TH AVE	PEGGY FARREL	HOUSE WAS FLOODED DUE TO WATER COMING IN OFF OF UH & 67TH SHE WANTSHER HOLE FIXED THROUGH DIKE AND PIPE PUT IN LIKE PROMISED THERE IS A LOWER AREA THAN ONE WHERE THE BREECH IN DIKE WAS CONSTRUCTED THE ENTIRE CANAL BEHIND HER HOUSE WAS FLOODED	SHE WANTS TO KNOW WHO MAINTAINED THE DITCH BETWEEN THE PROPERTIES OWNER SAYS THE CITY, CITY SAYS THE OWNER SOLUTION - LOOK INTO DEEPENING THE CANAL AND IMPROVING SIDESLOPES ETC THE CITY CLEANED THE DITCH ON 10/5/90 CITY LOOKING INTO DEEPENING AND	Yes	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
98	18410 N 70TH DR	ROBIN MICKELSON	FLOODED OUT ENGINEERS WERE OUT EARLIER AND NOTHING WAS DONE		No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
99	4511 LOMA LN	SITOR SKY	ALL DEBRIS FROM NORTHERN AVE WASHED INTO THEIR YARDTHEY ARE VERY OLD WANTS TO KNOW IF WE CAN ASSIST	NONE PRIVATE PROPERTY CITY NOT RESPONSIBLE	Yes	Yes	The Northern Ave. SD will resolve problem.
100	4914 W PUGET	BOB CUNNINGHAM	HE WANTS HOUSE CONDEMNED THE HOUSE IS OWNED BY HIM AND IT'S COMPLETELY FLOODED		No	Yes	Olive Ave. SD should have resolved issue.
101	4926 W FLYNN LN	LORETTA GIBSON	PARKING LOT-KISS THE COOK		Yes	Yes	The storm drains in Glendale should have mitigated problem.
102	5002 N 61ST AVE	DONALD A HUTCHINSON	FLOODS IN THE AREA WHEN WE DON'T GET MUCH RAIN ALSO WANTED THE CITY TO RE-DO HIS LANDSCAPING BECAUSE A TRUCK WAS IN HIS YARD AND DUG UP 2 FEET OF HIS LANDSCAPING		No	No	Construction of Camelback SD in future will resolve the problem.
103	5037 WEST WAITE PL	MRS MC RAYNOLDS	SOUTH EAST CORNER OF NORTHERN AND 51ST AVENUE TWO SINK HOLES CAUSED BY FLOODINGTHE HOUSE WAS ALSO FLOODED OUT	TOLD STREETS MAINTENANCE TO FILL HOLES IF IN R/W	Yes	Yes	Northern Ave. SD will resolve drainage problem. Olive Ave. SD should have helped situation.
104	51ST AVE @ CINNIBAR				Yes	No	Future SD in 51st Ave. will resolve problem.
105	5208 WEST ONYX	JOE OPLINGER	ON BLOCK WALL FENCE, SHOULD THEY HAVE PLACES TO DRAIN? NEIGHBOR HAS FLOODED WATER DRAINS INTO HIS HOUSE NEIGHBOR BLOCKS WATER 5200 BLOCK OF BROWN WANTS TO PUT DRAIN IN STREET	HE WILL WORK OUT DEAL WITH NEIGHBOR	Yes	Yes	Private issue.
106	5218 W GLENDALE AVE	CHARLES SANDS	SANDS INVESTMENT CORP BETWEEN 51 AND 52 AVE ON NORTH SIDE GLENDALE, 6 IN OF WATER		Yes	Yes	There were intersection improvements that should have resolved issue.
107	5234 W BERYL AVE	MRS AMITY	CLAIMS THAT THEY STARTED FLOODING WHEN THE APARTMENTS WENT IN SAME PROBLEM AS MR HINDENER		No	No	Would need to do a field check to see if basins are large enough.
108	5246 W GRAND AVE	ED MOORE	WHERE DOES WATER GO ONCE ON 51ST AVE?		Yes	maybe	ADOT improvements to intersection should mitigate flooding. BH Rd SD required to solve problem.
109	6210 N 86TH DR	MS SALDANA	LOTS OF ROCKS AND DEBRIS IN STREET PLEASE CLEAN ASAP	(STREETS)TALKED TO RESIDENT AREA IN QUESTION WAS UNDER CONST BY ESTES HOMES WHO FILED CHAPT 13WE HAVE CLEANED AREA AND PUT BIRM AT DEAD END	Yes	Yes	Prior solution
110	6413 N 47TH AVE	PAT IMMALE (EMILY?)	FLOODING SEWER BACKUP HAS HAD BACKUP VALVE INSTALLED, PROBLEM NOT CORRECTED SHE SAYS PROBLEM COMES FROM BURTON SCHOOL CATCH BASIN AND ROAD DRAINAGE THIS PROBLEM AFTER BURTON SCHOOL CHANGED DRAINAGE YARD WASHED OUT DUE TO WATER COMING IN AROUND MANHO	SEWER HAS BEEN FIXED ACCORDING TO ELISER ZUBIN SHE CALLED AGAIN ON 10-31-90 AND CLAIMS THAT ALLEN IAMPAGLIA PROMISED HER A SEWAGE PUMP AND PROMISED WE WOULD GROUT AROUND THE MANHOLE DOESN'T LOOK LIKE WE GROUTED AROUND MH AND DON'T KNOW ABOUT THE PUMP	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
111	6419 N 75TH AVE	MATT, MARLENE VERSLUIS	THE GENERAL HOMES' NEIGHBORHOOD WENT IN AND NOW THEY FLOOD THERE IS A DITCH NEXT TO A RUSSIAN GRAVEYARD CHECK OUT DITCH EST TO SEE IF THERE IS SOMEPLACE FOR THE WATER TO GO THE PEOPLE HAVE BUILT A BERM TO PROTECT THEIR PROPERTY BUT THE GENERAL HOPES	NO PLACE FOR WATER TO GO WHEN IT REACHES 75TH AVE COULD CUT SWALE S ALONG E SIDE OF 75THH AVE SHOULD BE REFFERED TO LARRY VASSEL DO NOT CALL LADY BACK	No	No	The street improvements to 75th Ave. should have helped but storm drain is needed to resolve issue.
112	6516 N GRAND AVE	KENT MEYERS	THE WATER COMES UP OUT OF THE INLETS ON GRAND AND FLOODS HIM OUT HE IS 18" ABOVE THE STREET AND HAD 18" OF WATER IN HIS BUILDING TOLD HIM TO CONTACT ADOT SINCE GRAND IS AN ADOT STREET		Yes	Yes	The basin at 63rd & Northern should have resolved issue.
113	6610 N 82ND AVE	MRS MARGARET BAKER	SAME AS 08-15-90, BUT THIS TIME WORSE AS MATTER ENTERED HOUSE CITY CREW IS PUMPING RETENTION BASIN AT THIS TIME	SEE ATTACHED MEMO FROM 8-16-90	Yes	Yes	Maryland street improvements completed and believe outfall across Maryland to another basin was constructed.
114	6661 W MARYJANE LN	DOROTHY BAKER	WATER UNDER TRAILER WOULD LIKE TO HAVE SOMEONE PUMP WATER FROM SITE		No	Yes	The 67th Avenue improvements should have helped resolve issues. Problem is really no street improvements within Granada Estates and trailers are low.
115	67TH AVE @ GREENWAY RD		DRAIN PLUGGED	NO DRAIN	No	Yes	The improvements to 67th & Greenway should have resolved issues.
116	67TH AVE @ PARKSIDE	TONY IANNANCCONI	PARKSIDE LANE AND 63RD AVE NO ACCESS TO HIS HOUSE AND ONE OTHER STREET WASHED AWAY HE CAN NOT GET OUTALSO NEIGHBOR LADY IS ON OXYGENALSO STRANDED	TEMPORARY REPAIR ADD ABC GRADE ON OUTSIDE AREA	Yes	No	Private issue between owners and location of driveways. Think it may have been resolved but not sure.
117	67TH AVENUE @ MARY JANE LN	MR DAVIS	SEVERAL MOBILE HOMES FLOODED OUT DUE TO CLOGGED INLETSHE CLEANS THE INLETS	HAVE CITY CLEAN INLETS SUPPOSED TO BE DONE TODAY	Yes	Yes	Prior solution
118	6810 N 54TH DR	ROBERT CISNEROZ	FLOODING FIRST TIME IN 40 YEARS		No	No	Problem was partially caused by narrowing street. Future extension of Glendale SD will resolve issue.
119	6818 N 54TH AVE	SPENCER BLACKBURN	HAD WATERCOME INTO HIS HOUSE FROM THE STREET WATER COMES IN OFF OF GLENDALE THINKS THE PROBLEM COULD BE SOLVED SOMEWHAT BY LOWERING THE STREET @ THE OLD R/R SPUR TO LET SOME OF THE WATER GO BY		No	No	Problem was partially caused by narrowing street. Future extension of Glendale SD will resolve issue.
120	6913 WEST GREENWAY RD	JESSE TORRES	WOULD LIKE TO HAVE SOMEONE COME OUT AND SEE PROPERTY BECAUSE OF FLOODINGHE WANTS THE CITY TO GET HIM SEVERAL LOADS OF DIRT TO HELP HIM OUT	TOLD LARRY VASSEL OF PROBLEM LARRY WILL PUT IT ON LIST	Yes	Yes	SD improvements in Greenway should have improved issue.
121	6960 W PEORIA AVE 7222 N 47TH AVENUE	BETTY RUSSELL	ABOVE PERSON CALLED LINDA OF DEPUTY'S OFFICE RE: FLOOD PROBLEM IF SOMETHING ISN'T DONE SOON SHE WILL BE CALLING THE MAYOR & LEGISLATURE THE PROBLEM IS AT 7222 N 47TH AVENUE IN GLENDALE PART OF THE PROBLEM MAY BE SEWER BACKUP CITY CHECKING SEWER		No	No	Northern Ave. SD should reduce water volume. Future extension of storm drain in Glendale up 47th should help.
122	7027 W WAGONER RD	MRS PALMER	SIX HOUSES FLOODED AT ARROWHEAD HER HOUSE WAS FLOODED WITH AT LEAST 1INCH OF WATER INSIDE		No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
124	7340 W OREGON	ROSEMARY	67TH & CAMELBACK, 75TH & CAMELBACK		No	No	Future BH Rd. SD should resolve problem.
125	8021 N 58TH AVE	SANDY & DUANE NELSON	POOL & PROPERTY DRAINAGE PROBLEM HUSBAND CALLED LAST TIME NO ONE CALLED BACK		No	Yes	The Olive Drain and impovements should have solved problem.
126	8401 N 67TH AVE	MARK MCFADDEN	ORANGE GROVE MOBILE HOME PARK IS FLOODING FLOODING FROM 67TH AND BUTLER	THEY ARE WORKING WITH AN ATTORNEY	Yes	Yes	Storm drain in 67th was completed.
127	85TH AVE @ NORTHERN AVE	PECINA	HAS WATER IN HIS HOUSE THE STORM DRAIN HAS BEEN CLOGGED BUT OPENED UP YESTERDAY DUE TO ALL THE WATER TOLD HIM HE WAS IN THE COUNTY AND SHOULD CONTACT THE COUNTY HIGHWAY DEPT		Yes	Yes	A storm drain in Northern was constructed by MCDOT which should have solved problem. Not in Glendale.
128	8603 E ROYAL PALM	GINNY ARMOUR	SHE HAS 2 APT PROJECTS THAT HAVE BEEN FLOODED; ONE AT 51 S OF CACTUSAND THE OTHER OFF PEORIA A LOT OF MUD & WATER		No	Yes	Don't know where the problems are.
129	8632 NORTH 55TH AVE	DAN COLEMAN	THREE FOOT WATER ALL AROUND HOUSE GOT FLOODED OUT TWO WEEKS AGO, GOTNEW CARPET, ETC AND NOW FLOODED AGAIN WANTS A MEETING	HELD MEETING 09/04/90	Yes	Yes	Olive Ave. SD should have resolved issue.
130	9127 N 44TH AVE	MICHAEL MORENO	FENCES ARE ALL DOWN ALL WATER FROM SHOPPING CENTER ALL PAVED AT BACK OF HIS PROPERTY COMES DOWN TO HIS HOUSE HIS PROPERTY IS MUCH LOWER THAN ANYTHING ELSE		No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
131	9127 N 44TH AVE	VICKY SCOTT	FENCE DOWN IN FRONT AND BACK		No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
132	9278 N 47TH CT	PAUL GALLEGOS	PROBLEM IS RETENTION BASIN FILLS UP AND THERE IS NO PLACE FOR THE WATER TO GO EXCEPT INTO HIS HOUSE WATER GETS INTO HOUSE AND HAS RUINED HIS CARPET	TOLD HIM THERE WASN'T ANYTHING THAT WE COULD DO SINCE IT IS PRIVATE PROPERTYHE COULD PUMP IT OUT INTO THE STREET IF NECESSARY TO HELP EMPTY BASIN CALLED AGAIN ON 9-10-90	Yes	Maybe	Private Issue.

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133	MYRTLE @ 45TH AVE	LILA TAFUNA	SEWAGE CAME THROUGH HOUSE	GLENN IS WORKING ON IT	Yes	No	Not storm drain issue. Northern Ave. SD should reduce water volume. Future extension of storm drain in Glendale up 47th should help.
134	59TH AVE @ BELL RD	DOUG BAKER	SHOPPING CENTER ON REAR PROPERTY LINE IS FLOODED DUE TO 'RUN OFF 59TH AVE AT ENTRANCE TO BRUNSWICK PROPERTY, FILLS RETENTION AROUND BRUNSWICK THEN SPILLS ONTO OUR PROPERTY FLOODING ENTIRE BUILDING 'D' PROPERTY WAS NOT DESIGNED TO HANDLE IT	SEND COPY OF NEWS RELEASE ON 59TH AVENUE CONSTRUCTIONDOUG WILL TALK TO BRUNSWICK ABOUT RAISING DRIVEWAYS	Yes	Yes	Prior solution
135	10602 N 49TH AVE	JOE GATTERDAM	49TH AVENUE AND PEORIA-WATER UP TO BACK DOOR/YARD-WANTS TO DO CONCRETEWORK ON SIDE OF PEORIA/RUINED DECKING ON POOL-MOUND OF DIRT ON THE OTHER SIDE OF WALL WASHED UNDER WALL INTO HIS YARD		Yes	Yes	Storm drain constructed as part of ID project should resolve issues.
136	11220 N 58TH DR	TONY WILLIAMS	MUD IN STREET WASHED FROM NEIGHBORS YARD	(STREETS) AREA CHECKED AND RESIDENT HAS VERY LITTLE DEBRIS ON STREET WE WILL SWEEP WHEN TIME PERMITS	Yes	Yes	Prior solution
137	4747 W MARLETTE	MARY ANN KINDRED	WHEN BURTON BASIN OVERFLOWS, THE WATER CROSSES MARLETTE AND GOES INTO HER HOUSE SHE HAD TO REPLACE THE CARPET PAD AND SOME OF THE CARPETING EXPLAINED THAT THE RAINS WERE VERY INTENSE AND THE WATER SEEKED ITS OWN ROUTE EVEN WITHOUT THE BASIN THE WAT	TOLD HER ABOUT THE BASIN BEING FIXED WITH THE LINE IN MARLETTE SHE WANTED THE BASIN DEEPER OR A BERM ALONG MARLETTE AVE TOLD HER WE COULDN'T DO THAT SHE WILL HOLD HER RECEIPTS FOR THE TIME THERE ARE FUNDS AVAILABLE TO PAY THE PEOPLE FOR THEIR REPAI	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
138	5001 W CAVALIER	DON GRIFFIN	FLOODING AT 51ST AVE AND BETHANY HOME WHAT IS BEING DONE AT THIS INTERSECTION ALL WATER COMES RIGHT DOWN TO HIS PLACE		Yes	maybe	ADOT improvements to intersection should mitigate flooding. BH Rd SD required to solve problem.
139	5240 W BERYL	GRANT HINDERER	DAMAGE RESULTED FROM OVERFLOW FROM APARTMENT COMPLEX THE BASIN IN THE APARTMENT IS 2' DEEP BUT COMES THROUGH THE WALL WHICH HE BUILT THE WALL IS NOT DESIGNED FOR THE WATER LOAD AND HE IS WORRIED ABOUT THE SITUATION THINKS THE BASIN ISN'T BIG ENOUGH	NONE UNTIL A DRAIN COULD BE BUILT IN PEORIA WHICH COULD RECEIVE AN OUTFALL	No	No	Prior solution
140	5434 N 73RD AVE	MRSBARRY FISK	HER HOME WAS BUILT LOWER THAN THE STREET AND THE WATER IS FLOODING HER YARD AND HOUSE SHE TALKED TO BUILDING SERVICES AND THEY TOLD HER IT WAS A DRAINAGE PROBLEM, SHE BELIVES IT IS NOT	TOLD HER TO HIRE AN ENGINEER TO ESTABLISH FAULT IF ANY EXPLAINED STORM WAS OVER 100-YEAR EVENT EXPALINED HER FIRST ACTION SHOULD BE AGAINST THE BUILDER (WHO SHE SAYS IS DEFUNCT) (1-10-91) THEY HIRED A SURVEYOR AND WAS TOLD THE HOUSE IS TOO LOW AND THE	Yes	No	Future BH Rd. SD should resolve problem.
141	5832 W EVERGREEN	MRS HIROSE	DRAINAGE PROBLEM-GOT FLOODED SAT EVENING	REFERRED TO BOB FLYNN	Yes	No	Future SD in 59th Ave. will resolve problem.
142	59TH AVE @ THUNDERBIRD AVE	CRAIG FARRIER	IS AT BURGER KING RESTUARANT THE LANDSCAPING WASHED OUT AND HE UNDERSTOOD IT WAS JOINT MAINTENANCE TOLD HIM TO CANTACT FEILD OPERATIONS TO FIND OUT	TOLD HIM TO CONTACT STREET MAINTENANCE	Yes	Yes	Prior solution
143	6112 W HEARN RD	BARB REIPTER	WATER FLOODED LANDSCAPING AND WASHED IT AWAY A METER BOX ACROSS STREET HAS BEEN WASHED AWAY WITH LARGE HOLE	CALLED CITY CREWS ABOUT METER W 894-9515 EXT 651	Yes	Yes	Prior solution
144	63RD AVE @ OLIVE AVE	BONNIE MARRIFIELD	SOMEONE IS PUMPING WATER OUT OF A RETENTION BASIN (OR SOMETHING) AT GCC OR SAHUARO RANCH PARK AND THE WATER IS POURING DOWN 63RD AVE IT WILL BE FOR 4-5 DAYS SHE THINKS THIS IS ILLEGAL	EXPLAINED TO HER HOW THE RETENTION BASIN IDEA WORKS ALSO HOW THE NEW PIPE IN OLIVE AND 63RD WILL WORK	Yes	Yes	Olive Ave. SD should have resolved issue.
145	67TH AVE @ PEORIA AV	CHUCK GERSTER	DRAIN PLUGGED	AREA IN QUESTION IS DRYWELL AND CAN'T TAKE ANY MORE WATER TIME WILL DECREASE WATER (STREETS)	Yes	Yes	Storm drain in 67th was completed.
146	7026 W WAGONER RD	CLYDE MILLER	THE PROBLEM IS IN THE DRAINAGE DITCH HE HEARD THAT ARROWHEAD RANCH ISPUMPING OUT OF THEIR LAKES WATER 8 INCHES INTO THE HOUSE	CITY CLEANING THE DITCH 10-5-90 CITY LOOKING INTO DEEPENING AND IMPROVING THE DITCH	Yes	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
147	70TH AVE @ RISNER	CHRIS STIGLER	SE CORNER 70TH & RISNER HAS A VACANT LOT WITH A TRANSFORMER SUBMERGED AT THIS TIME THE 71ST AVE DRAIN BROKE IN SEVERAL AREAS WHICH ALLOWED THE WATER TO DRAIN OUT CALLED APS ABOUT THE TRANSFORMER	FIX THE 71ST AVE DRAIN	Yes	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
148	7428 W READE	BEVERLY INFURNA	HAS A CONCERN ABOUT THE WATER AT 75TH AND CAMELBACK TOLD HER ABOUT THE PROJECTS IN CAMELBACK AND THE STORM DRAIN EXTENSION WITH PHOENIX	MAJOR STORM DRAIN IN CAMELBACK	Yes	Yes	Construction of BH Outfall Channel and storm drain improvements at 75th Avenue will allow street to drain.
149	7433 W REED	MR WEB	PROBLEM IS WATER ON 75TH AVE HE WANTS US TO CONSTRUCT DITCH TO CANAL AND SAYS SRP IS AGREEABLE	TALKED TO SRP, THEY ARE NOT TOLD HIM ABOUT PIPES IN 75TH AND CAMELBACK	Yes	Yes	Construction of BH Outfall Channel and storm drain improvements at 75th Avenue will allow street to drain.
150	9010 N 49TH AVE	KARLENE AKRE	HAS WATER WAIST DEEP IN THE STREET TWO HOUSES NORTH OF DUNLAP	TOLD HER OF THE STORM DRAINS THAT WERE GOING IN NEXT COUPLE OF YEARS	Yes	Yes	Olive Ave. SD should have resolved issue.

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151	9016 N 49TH AVE	BOB RUSSELL	COMPLAINT AGAINST WATER PASSED HIS CURBS FLOODED YARD STORM DRAINS NOT DOING THE JOB		No	Yes	Olive Ave. SD should have resolved issue.
152	9035 N 48TH AVE	CHARLES FERRAIUOLO	WATER CAME IN FROM WOODGLEN DEVELOPMENT AND DAMAGED THEIR POOL AND ALMOST CAME INTO THE HOUSE WANT SOMEBODY TO FIX POOL AND PAY FOR WATER, CHEMICALS, AND FENCE	CONST DRAIN IN OLIVE TO RELIEVE THE WOODGLEN AREA AND TO CONST DITCH / INLETS IN PROPERTY TO DRAIN THIS HAS BEEN AN ONGOING PROBLEM AND GOES WITH MR TALMADGE MASSEY WHO LIVES AT 9023 N 48TH AVE	No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
153	9115 N 44TH AVE	MR EISELY	ALLEY IS PAVED HIGHER THAN BACK YARD AND IS FLOODING		No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
154	51ST AVE @ DUNLAP AVE	DAVE FOTT	FLOODING ONTO PRIVATE PROPERTY TRY TO CALL BEFORE 9:30 AM TODAY	HE WANTS TO BUILD WALL TO KEEP WATER OUT OF PROPERTY TOLD HIM OKAY	Yes	Yes	Olive Ave. SD should have resolved issue.
155	10246 N 52ND DR	LINZA	FLOODING - 4 FEET HIGH IN APARTMENTS IN BACK OF HIS HOME, WATER THEN CAME INTO HIS YARD AND FLOODED HIS HOME (CEDAR COURTS APARTMENTS AT 52ND AVE & PEORIA)		No	No	Would need to do a field check to see if basins are large enough.
156	5026 W ROYAL PALM	WH WOODS	HAD WATER ON HIS PROPERTYSAYS WHY AREN'T THERE ANY INLETS HOOKED TO THE STORM DRAIN IN 51ST AVENUE?THERE USED TO BE AN INLET IN FRONT OF HIS PLACE BUT WAS TAKEN OUT WHEN THEY PUT IN RAMPS	TLD HIM WE WOULD TRY TO PUT UP SIGNS ABOUT NOT CROSSING IN FLOODED AREA	Yes	Yes	Northern Ave. SD should help resolve problem. Might need some local drainage.
157	51ST AVE @ OLIVE AV	JUDY WALKER	WHAT ARE LONG RANGE PLANS FOR DRAINAGE IN THIS AREA?	TOLD HER OF THE PLANS TO CONST STORM DRAIN IN OLIVE TO 59TH THIS YEAR AND TO 51ST IN THE NEXT COUPLE OF YEARS	Yes	Yes	Olive Ave. SD should have resolved issue.
158	5610 W PALO VERDE	RENE MULLANY	DURING LAST FLOOD ALL NEIGHBORS RUN OFF COME THROUGH AND UNDER THEIR WOOD FENCE-FLOODED YARD AND FILLED POOL W/MUD ETC HAD TO HAVE POOL DRAINED AND ACID WASHED 1ST TIME NOW IT HAPPENED AGAIN		No	Maybe	Private Issue. ID project should have built storm drain in Peoria which should help mitigate problem.
159	5929 W ORANGEWOOD	MRS POE	WAY THAT FLOODING CAN BE AVOIDED,SHE DID HAVE SOME FLOODING IN GARAGE		No	Yes	Orangewood Storm drain was connect to ADOT drain in Grand.
160	67TH AVE @ BELL RD	BILL LAMPERT	HAD WATER IN 167 STORAGE UNITS HE WANTS TO RAIS THE ENTERANCE INTO THE PROPERT TO KEEP WATER OUT TOLD HIM THAT WAS OK	RAISE ENTERANCE	Yes	Yes	Prior solution. Storm drain in 67th was constructed which should help problem.
161	7319 W DENTON LN	PAMELA WILLIAMS	WATER BACKED UP IN SEWER/PIPES ARE STOPPED UP DUE TO FLOODING CARPET AND WASS ARE A MESS		No	No	Future BH Rd. SD should resolve problem.
162	9135 N 44TH AVE	ROMY LYNCH	SHE HAD STANDING WATER THROUGHOUT HER HOUSE DURING THIS LAST STORM WANTS SOMETHING DONE SO IT WON'T HAPPEN AGAIN SHE WANTED TO KNOW IF THE PARKING LOT BEHIND HER WAS PUT IN CORRECTLY	TOLD HER WE WERE BUILDING STORM DRAIN BUT IT WOULD TAKE YEARS AND WOULDN'T HELP WITH A STORM LIKE THE ONE WE HAD TOLD HER SAND BAGS WOULDWERE AND ARE AVAILABLE	Yes	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
163	OLIVE AVE @ 56TH AVE	JEAN CRUMP	CONCERNED WITH THE FLOODING IN OLIVE 55TH TO 56TH TOLD HER ABOUT THE STORM DRAINS INTENDED IN THE NEXT COUPLE OF YEARS	STORM DRAIN IN OLIVE	Yes	Yes	Olive Ave. SD should have resolved issue.
164	51ST AVE @ CACTUS RD	DARLENE	WATER CAME IN OFF OF 51ST AVE WHICH FLOODED POOL AND PARKING AREA HAD A LOT OF MUD EVERYWHERE	VISITED WITH HER ABOUT STORM INTENSITY ETC	Yes	Maybe	Not sure of location. ACDC should have resolved issue.
165	18202 N 64TH DR	JENS EIKAAS	THE NEW SUBDIVISION TO THE SOUTH IS CREATING A PROBLEM (W)863-8040		No	Yes	Skunk Creek was channelized to contain 100-year flows.
166	5242 W RIVERIA DR	HARVEY YEE	ATER COMES OVER YO HIS PROEPRTY		Yes	Maybe	Not sure of location. ACDC should have resolved issue.
167	59TH AVE @ ACOMA-CROCUS	MARY COLEMAN	THEY HAD WATER INTO THEIR GARAGE DISCUSSED THE HEAVY RAINFALL AND UNUSUAL SITUATION		Yes	Yes	59th Ave. Storm drain should also have solved problem.
168	59TH AVE @ MONTE CRISTO	PAM GOODMAN	CONTRACTOR CONSTRUCTED BERM WHEN DURING THE CONSTRUCTION ON 59TH AVENUE WHICH DIRECTED THE WATER INTO THEIR PROPERTY WE TOLD HER IT WAS A CONTRACTOR LIABILITY AND SHE SHOULD CONTACT THEM SCOTT BARRY HELPED HER AND SHE GOT IN CONTACT WITH THE CONTRACT	SHE GOT CHECK FROM THE CONTRACTOR	Yes	Yes	59th Ave. Storm drain should also have solved problem.
169	7322 N 69TH AVE	MRS SINGLETON	FIELD AT 67TH AND MYRTLE OWNED BY SUN-STATE IS THE LOCATION WHERE THE DIRT AND MUD IS COMMING FROM AT THEIR PLACE TOLD HER WE COULDN'T DO MUCH WITH THE PRIVATE PROPERTY BUT WOULD TRY		Yes	Yes	Orangewood Ave. Storm Drain should have solved issue.
170	9260 N 47TH CT	MRS ICHARD COMPTON	PET AND GARAGE		Yes	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
171	19013 N 71ST LN	PAM PEARSON	VACANT LOT BUT THEY WERE GOING TO CONST A HOUSE THERE WANTED TO KNOW IF IT WOULD GET FLOODED	ELEVATE NEW HOUSE ABOVE STREET	Yes	Yes	Prior solution.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
173	4901 W CITRUS WAY	MRS HENRY MAYA	WAY BY DETENTION BASIN WATER FLOODED INTO THE HOUSE ONTO CARPETNEIGHBOR HAD SAME PROBLEM		Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
174	5950 W MISSOURI	JUNE FARREL	YARD HAS CAVED IN BECAUSE OF FLOODING		No	No	Future storm drain in Camelback and 59th will resolve issue.
175	6352 N GRAND AVE	LUCY TERONES	CARPET, MUD ALL OVER DAMAGE TO CLOTHESCARE TAKER'S MILLIE 937-4166		No	Yes	basin at
176	4511 W LOMA LN	AL SECARSKI	HAD WATER INTO THE HOUSE FOR THE FIRST TIME THIS FLOOD BUT HAS HAD WATER IN THE STREET MANY TIMES OVER THE YEARS HAD DAMAGE TO CARPETS, DRAPES ETC THE WATER COMES DOWN 45TH AVE FROM BUTLER WHICH FLOODS THE CUL DE SAC	BUILD STORM DRAIN IN NORTHERN PROVIDE DRAIN TO CUL DE SAC	Yes	Yes	The basin at 63rd & Northern should have resolved issue.
177	59TH AVE @ THUNDERBIRD RD	MRS DUNSFORD	THE RETENTION IN THEIR DEVELOPMENT FILLS UP AND DOESN'T HAVE ANY PLACE TO GO SO GETS INTO THEIR GARAGE SEVERAL HOUSES HAVE THIS PROBLEM SHE WANTS TO KNOW IF THEY CAN BUILD A DRAIN TO THE NEW STORM DRAIN IN 59TH AVENUE	HAVE THEM SUBMIT PLANS TO CONSTRUCT A BLEEDOFF TO 59TH AVE DRAIN	Yes	Yes	59th Ave. Storm drain should also have solved problem.
178	7844 N 59TH LN	JOSYLN BROWN	FLOODING DUE TO RUN OFF FROM 59TH AVE COMING ACROSS FEILD AND ACROSS STREET	THERE ARE CATCH BASINS IN 59TH AVE AND PROPERTIES ARE BANKED HIGH UNTIL GLENDALE MEDICAL CENTERTHE WATER LOOKS LIKE IT WENT INTO PARKING LOT AND PREAD OUT ACROSS VACENT LOTFROM THERE IT SPREAD OUT ACROSS THE LOT TIL IT HIT 59TH LANE WHERE IT CROSSED IT	Yes	Yes	Northern Ave. SD should resolve issue.
179	14032 N 60TH AVE	RAY WIETERS	GOT MAILING STATING PROPERTY REMOVED FROM FLOODPLAIN SO HE CANCELED INSURANCE THINKS THE CITY IS AT FAULT FOR FLOODING SINCE TOLD HIM HE DIDN'T NEED INS ALSO THINKS THE DIRT PILE AT CALVAR IS TO BLAME SINCE IT BLOCKS THE DRAINAGE TO ACDC HE PLANS	REFERED HIM TO RISK MANAGMENT AND TOLD HIM THERE WASN'T MUCH WE COULD DO EXCEPT WORK WITH FCDMC TO GET THE DRAINAGE IMPROVED TO ACDC TOLD HIM WE WERE IN CONTACT WITH THEM ABOUT SOLVING THE PROBLEM HE HAD ALREADY TALKED TO RISK MANAGMENT	Yes	Yes	Improvements to ACDC were made.
180	9272 N 47TH CT	BRAD SOLIE	CARPET DAMAGE		No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
181	4511 W GOLDEN LN	RHEMA BRANDT	43RD FROM PEORIA-NORTHERN-SAND FROM LANDSCAPING IN CURB LANE		No	Yes	Olive Ave. SD should have resolved issue
182	5848 W WINCHCOMB	BEVERLY JOLLIFFE	NEW OWNERS AND THE HOUSE AND GARAGE GOT FLOODED THIS APPEARS TO BE A PRIVATE STREET SHE LIVES IN THE LOW END OF THE TOWNHOUSE COMMUNITY	TOLD HER SHE COULD HAVE THE BASIN ENLARGED SHE ALSO GOT WATER IN GARAGE ON 9-21 PROBLEM IS WITH TOWNHOUSE OWNERS ASSOC AND NOT MUCH CITY COULD DO W 265-1717	Yes	Yes	59th Ave. Storm drain and street improvements should also have solved problem.
183	16020 N 66TH DR	DAVE WOLF	WATER ENTERED HIS PROPERTY HE WANTS THE CITY TO BUILD HIM A BERM TO KEEP THE WATER OUT OF HIS PROPERTY LIKE THE ONE BUILT FOR MR DAVID GILES AT 66TH AND PARADISE HE CLAIMS THAT MARTY AUTHORIZED THE BERM CONSTRUCTION	BUILD BERM?	No	Yes	67th Ave. SD and street improvements should have resolved issue.
184	6019 N 51ST AVE	CONNIE NEWLIN	5 HOUSES HAVE BEEN FLOODED 2 HAD TO BE EVACUATED FLOODED BOTH IN AUGUST AND SEPTEMBER WATER COMES IN THROUGH TRAILER PARK, CAR LOT, AND IN FROM 51ST AVE ROSE LANE PARK OVERFLOWED	KEEP WATER OUT OF AREA 275-8162	Yes	Maybe	ADOT improvements to intersection should help resolve issue. Future BH Rd. SD will resolve issue.
185	7006 N 76TH DR	DONNA BUTLER	WATER IS GETTING INTO HER HOME DUE TO STREET FLOODING		No	Maybe	Orangewood SD should help reduce water volume and Glendale Street improvements should help relieve problem.
186	9002 N 56TH LN	MRS WILBAIN	8'' OF WATER IN HOUSE 2 STORAGE SHEDS FLOODED AND DAMAGE TO POOL WATER IS COMMING IN OFF OF OLIVE AND DOWN 66TH LANE INTO YARD AND HOUSE SHE WANTS TO SUE THE CITY SINCE SHE DOESN'T HAVE FLOOD INSURANCE	TOLD HER OF STORM DRAIN BUT SHE THINKS THE CITY IS LAZY AND WON'T GET IT DONE BEFORE SHE IS DEAD W 239-4777	Yes	Yes	Olive Ave. SD should have resolved issue.
187	9123 N 44TH AVE	BETTY SCOTT	CITY PAVED ALLEY BETWEEN HOMES AND SHOPPING CENTER AND CAUSED FLOODING' HAVE NOT HAD PROBLEMS PRIOR TO THIS SUMMER'S RAINS THE WATER RUINED THE FENCES ETC	VISITED SITE: PAVING TOO OLD TO VERIFY BY WHOM HOWEVER A VALLEY GUTTER IS PRESENTCOULD BE WATER BACKING UP FROM OLIVE AVENUEI EXPLAINED TO CITIZEN THAT THIS IS VERY LIKELY A CASE WHERE STORM EXCEEDED NORMAL DESIGN CRITERIATOLD HER TO CALL RISK MANAGEM	Yes	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
189	8102 N 55TH AVE	EC LACY	WATER ENTERED HER PROPERTY AND WANTS THE CITY TO PAY FOR THE DAMAGES THE TOLAL COST OF DAMAGES IS $113	ALLEN IAMPAGLIA RESPONDED WE WON'T PAY	Yes	Yes	Northern Ave. SD and future drain in 55th Avenue will resolve drainage problem. Olive Ave. SD should have helped situation.
190	8920 N 55TH AVE	JIM HALLEN	WATER ENTERED ONTO HIS PROPERTY AND INTO HIS HOUSE OFF OF 55TH AVE ONE OF THE MAJOR PROBLEMS IS THE TRAFFIC WHICH CREATES WAVES WHICH CREATES THE DAMAGE CITY WOULDN'T BARRICADE THE STREET HAD AN ELECTRICAL TRANSFORMER UNDER WATER IN BACKYARD WANTED	CONST STORM DRAIN IN OLIVE AVE	No	Yes	Olive Ave. SD should have resolved issue.

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191	4608 N MARYLAND	MRS FISHBEIN	WATER COMES INTO AREA FROM THE N & E SHE WANTS TO KNOW WHAT THE CITY WILL DO TO SOLVE HER PROBLEM TOLD HER WE WERE WORKING ON IT BUT THERE WOULDN'T BE MUCH DONE TO HELP UNTIL THE DRAINS IN GLENDALE AND 51ST AVENUE ARE COMPLETED IN THE FUTURE	REFERED HER TO RISK MANAGMENT IF SHE WANTS TO FILE CLAIM	Yes	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
192	4733 W EVA	DON BALLINGER	NEIGHBOR CONSTRUCTED A WALL WHICH BLOCKS DRAINAGE NEIGHBOR WON'T REMOVE THE BLOCKAGE TOLD HIM THE CITY WASN'T INVOLVED BETWEEN NEIGHBORS AND THE ONLY RECOURSE MAY BE A SUIT AGAINST HIM HE SAYS FINE BUT HOPES THE CITY CAN DO SOMETHING IN FUTURE	CONSTRUCT A BASIN IN 47TH AVE AND CONST A STORM DRAIN IN OLIVE ARE THE ONLY THINGS WHICH MAY HELP	Yes	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
193	61ST AVE @ GARDENIA	VELMA HORTON	PROBLEM IS THE WATER HITS HER AREA FROM 3 DIFFERENT DIRECTIONS N E & WEST A CHURCH ALONG HER BACK LINE BUILT A WALL WHICH BLOCKS THE FLOW OF WATER SHE SAYS THE CITY PAID FOR THE HOUSE IMPROVEMENTS AS PART OF THE NEIGHBORHOOD REDEVELOPMENT SO WE S	NEIGHBORHOOD IS VERY AWARE OF HER AND HAVE PLANNED TO WRITE HER A LETTER TOLD HER TO CONTACT THE CHURCH AND TRY TO WORK OUT SOMETHING BUT WE COULDN'T DO ANYTHING SINCE ON PRIVATE PROPERTY SHE CALLED BACK ON 10-11-90 AND TOLD HER THE SAME	Yes	Yes	Private Issue. Northern Ave. Storn Drain should resolve issue.
194	66TH AVE @ GREENWAY RD	JOANNA SORACE	PROBLEM IS THE LACK OF BERMS IF THEY WERE BUILT AND MAINTAINED THEN THERE WOULDN'T BE A PROBLEM REFERED THE PROBLEM TO STREET MAINTENANCE TO CLEAN THE EXISTING DITCH AND SEE IF THEY CAN FIX THE BERMS	IMPROVE THE DITCH AROUND SCHOOL AND PROVIDE BETTER OUTLET TO PIPE AT 67TH AVE	Yes	Yes	The improvements to 67th & Greenway should have resolved issues. Also improvements to drainage channel around HS should have helped.
195	7129 W UNION HILLS DR	ED GOETZ	BUILDING IS CONSTRUCTED BELOW ROAD GRADE FRONTAGE ROAD TAKES THE WATER FROM UNION HILLS AND OVERFLOWS TO HIS PROPERTY THE INLETS ARE CONSTRUCTED IN THE WRONG PLACE WANTS THE CURBS REMOVED AND PUT BACK IN HIGHER	ADD INLETS AND PIPE THEM TO UNION HILLS DRAIN COULD ALSO RAISE THE CURBS BUT THE PROBLEM IS THE HOUSE IS TOO LOW HE CALLED AGAIN ON OCT 5TH	Yes	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
197	6102 W Cheryl Dr	SAM PIGNATO	INLET AT CORNER ISN'T BIG ENOUGH WO WATER BACKS UP ABOVE CURB AND OVERFLOWS OVERFLOW CREATES PROBLEM WITH THE TRAFFIC CAUSING WAVES ETC HE ALSO CALLED IN THE AUGUST 13 STORMS	OPEN UP A SCUPPER AT END OF STREET INTO THE BASIN TO ALLOW THE STREETS TO DRAIN PUT THIS AS A FUTURE PROJECT	No	No	Need to improve drainage access to basin.
198	4500 GRAND AVE	ARMANDO FELIX	HAS BEEN FLOODED SEVERAL TIMES DUE TO SURFACE WATER ENTERING ONTO HIS PROPERTY	EXPLAINED LONG RANGE GOALS	Yes	Yes	ADOT has resolved drainage issues.
200	7005 N 77TH AVE	RON MATHESON	COMPLAINED THAT WORK DONE IN 68 CAUSED HIS PROBLEM NORMALLY THE INLET WEST OF HIS PROPERTY CLOGGS UP AND HE CALLS THE STREET MAINTENANCE PEOPLE AND THEY FIX IT AND THE WATER DRAINS AWAY WE NEED TO BUILD BIG PIPES LIKE IN CALIFORNIA	TOLD STREET MAINTENANCE ABOUT THE INLET AND THEY WERE GOING TO CLEAN IT	Yes	Maybe	Orangewood SD should help reduce water volume and Glendale Street improvements should help relieve problem.
201	4788 W BETHANY HOME RD	MR BISHOP	WATER ON BETHANY HOME ENTERS HIS PROPERTY AND CREATES FLOODING PROBLEMS	WANTS TO KNOW WHAT HE CAN DO TO KEEP WATER OFF PROPERTY	No	No	Problem will be solved when the BH SD is constructed and positive outfalls from the Maryland Lakes and Rose Lane basins are constructed.
202	6844 W SAN JUAN AVE	LOUIS LUGO	CORNER IS FLOODED AT 69TH AVE AND SAN JUAN-HAS NEVER FLOODED BEFORE THIS IS FIRST YEAR		No	No	BH Rd. Storm Drain and Camelback Rd SD and 67th Ave. SD will need to be constructed to solve problem.
203	7556 N 49TH AVE	ERIN RHODES	1/2 STREET EAST A DRAIN WAS BUILT SOME TIME AGO BY THE CITY SINCE THAT TIME SOMEBODY HAS DON UTILITY WORK AND PILEDDIRT SO WATERCAN'T GET TO DRAIN	CLEAN STREET	Yes	Yes	Not really storm drain issue. Northern Ave. SD will eliminate most of water.
204	8138 N 56th Ave	Sandle Mackeltraig	Water comes down 55th Ave to royal Palm then splits and goes down royal Palm to 56th and then goes south through his house He gets the water into his back yard which then goes through his garage to the front Water hasn't gotten into house yet Open	Wants to const a wall or something to keep water out Told him that was a good idea and could even put in a water tight gate like on 55th ave He will look into doing that Need to check out what can be done to open ditch to Mins Farm and keep the wat	Yes	Yes	Olive Ave. SD reduced amount of water. Northern Ave SD and future 55th Ave. SD will resolve problem.
205	9023 N 48th AVE	TALMADGE MASSEY	property to east was developed and elevated 1'+- all the water collects on his property & he has been flooded many times over the last rainshas to have his pool pumped out each time it rainssaysto talk to mary or tom sedlmeir for more info	claim was paid once by risk management CALLED FIRST ON 9-5-90 AS WELL AS OTHER TIMES IN THE PAST	No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
206	7109-3 N 76TH AVE	CYRIL TAMMAGE	WATER ENTERED HIS PROPERTY FROM AN ALLEYWATER RUNS OFF A COMMERCIAL SITE INTO A ALLEY AND THEN ON HIS PROPERTY	BUILD BERM/WALL TO KEEP WATER OUT	Yes	Maybe	Orangewood SD should help reduce water volume and Glendale Street improvements should help relieve problem.
207	7529 N 61ST AVE	FRANK PATTERSON JR	WATER EXCEEDED THE STREET CAPACITY AND FLOOD PROPERTY HE CLAIMS THE STREET WAS RAISED DURING THE ID WHICH NOW CAUSES THE FLOODING THE ID TOOK PLACE IN 1959 AND DIDN'T RAISE THE E SIDE OF THE STREET CROWN AND WEST SIDE DID RAISE WANTS TO PUT IN I		Yes	Yes	Northern Ave. SD should resolve issue.

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208	14068 N 61ST AVE	CAROL BECK	WATER CAN'T GET INTO THE ACDC DUE TO SMALL OPENING AND BACKS UP INTO HER GARAGE MANY TIMES, BUT LABOR DAY WAS FIRST TIME IN HER HOUSE	GET ENTRANCE INTO ACDC FIXED	No	Yes	Think the entrances to ACDC were enlarged.
209	56TH AVE @ ORCHID LN	JACKIE ROBINS (ROBBINS	HAD SEVERAL FLOODS GET INTO THEIR HOUSE THEY HAVE TALKED WITH US SEVERAL TIMES AND WE HAVE COMMITED TO DOING SOMETHING TO FIX THE PROBLEM SHE WANTS TO KNOW IF THEY CAN BUILD A WALL ACROSS THE FRONT TO KEEP WATER OUT TOLD HER GOOD IDEA TOLD HER WE		Yes	Yes	Olive Drain was constructed to reduce total flow. Basin outlet improved and street opening into basin was improved.
210	51ST AVE @ OLIVE	JIM KASZUSKI	PATIO HOMES HAVE WALLS AROUND WHICH DO NOT LET THE WATER OUT WANTS TO KNOW IF THERE IS SOMETHING WHICH CAN BE DONE TO HELP TOLD HIM TO GET THE AERIAL PHOTOS AND MAYBE WE CAN SEE SOMETHING TOLD HIM HE MAY NEED TO HIRE AN ENGINEER TO FIX THE PROBLEM		Yes	Yes	Olive Ave. SD should have resolved issue.
211	5229 W CROCUS DR	KEN WILSON	WATER ENTERS HIS PROPERTY ON EVEN MINOR RAINS ON THE LABOR DAY STORM HE HAD WATER IN HOUSE AND RUINED RUGS ETC THE TRAFFIC IS PART OF THE PROBLEM DUE TO THE WAVES 52ND DR & CROCUS IS A LOW AREA WHICH ACCUMULATES WATER WHICH GETS INTO HIS HOUSE W	TOLD HIM I WOULD LOOK INTO IT AND SEE WHAT COULD BE DONE	Yes	No	No storm drains in area.
212	6767 W BUTLER DR	CHRISTOPHER HIMES		EVENINGS 486-2199	Yes	Yes	Storm drain in 67th was completed which should solve problem.
213	7724 N 67TH AVE	BRIT MARSHALL	HAD OVER 25" OF WATER IN BUILDING THEY HAD SEVERAL TENANTS WHICH RECEIVED DAMAGE TOLD HIM OF SBA LOANS AND HE WAS AWARE OF THEM THE WATER WAS MUDDY AND HAD A LOT OF DEBRIS WHICH HAD TO BE CLEANED UP AFTER THE RAINS WATER MUST HAVE COME IN OFF	CONSTRUCT THE ORANGEWOOD OUTFALL TO RELIEVE THE AREA	Yes	Yes	Storm drain in 67th from Orangewood north should be complete
214	5710 W NORTHERN RD	TONY MAKHOL	WATER COMES IN FROM THE EAST AND NORTH AND FILLS NORTHERN AND BACKS INTO HIS HOUSE AND YARD HAD MAJOR PROBLEM WITH HIS DOGS ECT SINCE THEY HAD NO PLACE TO STAND EXCEPT ON THE SAND BAGS CARS CREATE WAVES WHICH MAKE THE PROBLEM WORSE	TOLD HIM OF THE PROPOSED ORANGEWOOD OUTFALL AND THE FACT IT MAY NOT BE BUILT FOR SEVERAL YEARS	Yes	Yes	Orangewood Drain is complete and Northern SD is under construction
215	6611 W EVA ST	OPAL SHAVER	WATER ENTERED THEIR PROPERTY AND FILLED THEIR YARD AND FILLED UNDER THEIR MOBIL HOME WATER SOAKED THE INSULATION AND HAD TO BE PUMPED OUT FROM UNDER THE HOME SHE COMPLAINED ABOUT THE EXPENSE AND SMELL AND THAT ALL THE NEIGHBORS ALSO HAD A PROBLEM	EXPLAINED TO HER ABOUT THE SBA GIVING OUT LOW INTEREST LOANS ETC BUT SHE WASN'T INTERESTED AND SAID HER SON WOULD FIX IT SHE SAYS MOST OF HER NEIGHBORS HAVE FLOOD INSURANCE	Yes	Yes	Storm drain in 67th was completed.
216	7102 N 43RD AVE	PAUL GRIEGER	HAD WATER ENTER THROUGH A HOLE BROKEN IN WALL BY NEIGHBOR NEIGHBOR BROKE THE HOLE TO HELP DRAIN WATER OUT OF PROPERTY PAUL WANTED TO KNOW IF THERE WAS ANYTHING TO BE DONE TO SOLVE PROBLEM	TOLD HIM THE BEST SOLUTION IS TO WORK WITH NEIGHBOR AND FIND WAY TO PASS THE WATER WITHOUT DAMAGING HIMSELF OR OTHERS PAUL SAYS IT CAN BE DONE TO TAKE THE WATER TO PALMEIRE WITHOUT MUCH PROBLEM	Yes	Maybe	Private Issue.
217	14623 N 64TH AVE	LAURA GILLETTE	THE WALL WHICH WAS BROKEN OUT DURING THE LABOR DAY FLOOD HAS NOT BEEN REPLACED SHE IS CONCERNED AND WAS TOLD IT WOULD BE PUT BACK UP SHE WANTS TO KNOW WHEN WE WILL FIX IT TOLD HER IT WAS BROKEN OUT BY THE NEIGHBORS AND NOT THE CITY	TOLD HER THAT LEONARD HUDSON IS ONE OF THE PEOPLE THAT BROKE OUT THE WALL ANS SHE SHOULD CONTACT THEM THE PLANS INDICATE THE WALL IS ON PRIVATE PROPERTY AND NOT ON CITY ROW REPAIR WALL AND ADD SCUPPER TO RELIEVE DRAINAGE PROBLEM WORK PHONE 542-4951	No	Yes	Think the entrances to ACDC were enlarged.
218	4630 W GRAND AVE	JEFF FERENZ	THEY WERE FLOODED WITH 4' OF WATER THIS HAPPENS EVERY OTHER YEAR AND EVEN WITH FLOOD INSURANCE IT COST THEM $130,000 HE THINKS THE STORM DRAINS ARE INADEQUATE TOLD HIM THEY WERE BUT THERE WASN'T MUCH WE COULD DO UNTIL THE DRAIN IS CONSTRUCTED	REFERED HIM TO SBA @ 1-800-468-1710	Yes	No	BH Rd. Storm Drain needs to be constructed to solve problem. Possible connection to basin at 43rd & Grand would help.
219	6141 N 59TH AVE	LINDA TISHCHLEDER	THEY WERE FLOODED DURING THE SEPTEMBER STORMS AND WANTS TO KNOW WHAT TO DO ABOUT IT SAYS THE LOWER APTS WERE FLOODED AND THEY WANT TO KNOW IF WE CAN INSURE IT WON'T HAPPEN AGAIN TOLD HER WE COULDN'T GUARANTEE ANYTHING IT WOULDN'T HAPPEN AGAIN	TOLD HER THERE MAY BE SOMETHING THAT COULD BE DONE WITH BERMS ETC BUT I COULDN'T DO ANYTHING IMMEDIATELY WILL GET TOGETHER LATER IN THE MONTH DENNIS SCHILLING FROM METRIC PROPERTIES 991-0088 SAYS THE WATER CAME IN FROM THE SEWER TOLD HIM WE WOULD	Yes	No	BH Rd. Storm Drain and 59th Ave. SD needs to be constructed to solve problem.

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220	6707 W PALMAIRE	EARL MCCLELLAN	COMPLAINED ABOUT RAISED AREA NEAR ROW DRAINS ONTO HIS PROPERTY CREATING FLOODING AND MUD THERE IS A BERM ALONG THE ROW WHICH DISSAPEARS NEAR THE ALLEY AT THE SOUTH SIDE OF PROPERTY WATER ENTERS AT THIS LOCATION AND FLOODS ALLEY AND PROPERTY	CONST A BERM AND ELEVATE THE ALLEY TO KEEP WATER IN 67TH AVE PROBLEM WILL BE SOLVED WITH FUTURE STREET CONSTRUCTION CONST THE BERM MAY CREATE LOW AREA ON 67TH WHICH MAY FLOOD	No	Yes	Orangewood Ave. Storm Drain should have solved issue. Street improvements to 67th Ave should also help issue.
221	6106 W PORT AU PRINCE	LARRY WHITNEY	WATER COLLECTS IN FRONT OF HIS HOUSE AND CREATES PUDDLE WHICH HAS NOW DETERIORATED THE PAVEMENT WATER COMES FROM OVERWATERING OF YARDS AS WELL AS RAIN THIS HAS BEEN A PROBLEM FOR 4 YEARS AND HE HAS COMPLAINED BEFORE HE WAS REFERED TO STREETS BUT DI	SPOKE WITH JERRY CARLSON AT STREETS AND HE WILL GO OUT TO LOOK AT PROBLEM AND FIX THE STREET IF POSSIBLE IF IT IS A SUMP AND HE CAN'T FIX IT WITH ASPHALT HE WILL CALL AND LET ME KNOW	Yes	Yes	59th Ave. SD should have mitigated the problem.
222	10651 W GLENDALE AVE	SONNY RIVERA	CLAIMS THE WATER FROM GLENDALE ENTERS HIS PROPERTY AND WASHES AWAY HIS BANKS THE WATER COMES FROM GLENDALE AVE WEST OF HIS PLACE AND CUTS DOWN 107TH TO THE SW COR OF HIS PROPERTY WANTS THE CITY TO FILL THE AREA AND LET THE WATER FLOW ON BY WANTED	HAVE STREETS PUT A BERM ACROSS THE LOW AREA WHICH WILL ALLOW THE WATER TO PASS HE WILL PUT IN A BERM AND FILL HIS FRONT PROPERTY TO PASS THE WATER ON DOWN GLENDALE AVE TO THE RIVER	Yes	Maybe	Think this issue was solved with street improvements
223	8010 N 56TH AVE	ROY WEIDIG	NORTHERN IS BUILT HIGHER THAN 56TH WHICH MEANS THE WATER MUST BACK UP ONTO HIS PROPERTY EVERYTIME IT RAINS HE CLAIMS THE CITY IS AT FAULT SINCE WE ALLOWED THE PROPERTY TO BE BUILT LOWER THAN THE STREET TOLD HIM WE HAVE PLANS FOR A STORM DRAIN IN THE	CONST THE STORM DRAIN AND POSSIBLY LOWER NORTHERN IN THE FUTURE NOT MUCH WHICH CAN BE DONE AT THIS TIME	No	Yes	Northern Ave. SD will resolve drainage problem. Olive Ave. SD should have helped situation.
224	16001 N 67TH AVE	RON BECK	WATER ENTERS HIS PROPERTY BECAUSE 67TH AVE IS TOO HIGH AND WON'T LET THE WATER OUT PROBLEM WAS MADE WORSE SINCE THE STORM DRAIN WAS BUILT HE CLAIMS THAT WHEN THE STORM DRAIN WAS BUILT THE STREET WAS RAISED OVER 1' CREATING THE PROBLEM NEEDS INLET O	LOWER 67TH AVE DURING THE FINAL DESIGN COULD CONST INLETS ALONG 67TH AVE TO PICK UP THE FLOW IN THE INTERIM WILL CALL HIM BACK AND LET HIM KNOW WHAT I HAVE FOUND OUT	Yes	Yes	67th Ave Street improvements resolved the issue. The street was NOT raised as claimed.
225	6107 N 51ST AVE	DAVE SCIOTTO	WATER BACKS UP ON 51ST DUE TO THE RAILROAD AND FLOOD HIM OUT WAS FLOODED TWICE THIS YEAR IN AUGUST AND SEPTEMBER TOLD HIM ABOUT THE MASTER STORM DRAIN PLAN AND THE POSSIBLE SOLUTION AT 59TH AND BETHANY HE HOPES SOMETHING GETS DONE SOON		Yes	maybe	ADOT improvements to intersection should mitigate flooding. BH Rd SD required to solve problem.
226	17205 N 66TH AVE	DAVE PIKE	THE NEIGHBORS BETWEEN HIM AND SKUNK CREEK HAVE BUILT BLOCK WALLS WHICH BACK THE WATER ONTO HIS PROPERTY WHICH USED TO FLOW TO THE CREEK THEY ARE BUILDING MORE WALLS NOW WHICH WILL MAKE THE SITUATION WORSE I TOLD HIM TO CONTACT CODE ENFORCEMENT TO HAV		No	Maybe	Skunk Creek improvements should have helped. Otherwise private issue.
227	4764 W EVA ST	MRS SCHNEIDER	THE SIDE YARD IS FULL AND THE DRAIN IS FULL		No	Maybe	Olive Ave. SD should have resolved issue. Might need to have local storm drain constructed
228	18048 N 69TH DR	CARL RICHARDSON	WATER GETS IN THEIR STREET EVERY TIME THERE IS A MAJOR RAIN WHICH CREATS A NUISANCE PROBLEM HAVE BEEN IN CONTACT WITH THE CITY BEFORE AND NEVER HAD ANY SATISFACTION CALLED THE CITY MANAGER'S OFFICE TO COMPLAIN ON THE 17TH		No	Maybe	67th Ave. Street improvements may have helped. There are no curbs or other improvements which were built under county jurisdiction. People have built block walls etc which are in violation of the restrictions on the plats.
229	8605 N 59TH AVENUE	SHELLY HOWARD	ON SITE DRAINAGE PROBLEM WITH WATER COLLECTING IN THE PARKING AREA TOLD HER TO CONTACT HER LANDLORD ABOUT FIXING IT SINCE IT IS NOT A CITY PROBLEM	HAVE LANDLORD INSTALL DRY-WELL OR OTHER SOLUTION	Yes	Maybe	Private issue.
230	17846 N 70TH DR	PHIL HIEM	WATER PONDS ON HIS PROPERTY DUE TO THE 71ST AVE DRAIN CONSTRUCTION WHICH CAUSES HIS LEACH PIT TO BACK UP INTO HIS HOUSE MET HIM ON THE SITE AND EXCAVATED A DITCH WHERE HE CLAIMED THE PROBLEM WAS TO DRAIN THE WATER HE HAS DONE SOME DIGGING TO DRAIN	REMOVE THE BERM ADJACENT TO HIS PROPERTY THE CONTRACTOR WAS SUPPOSE TO REMOVE THE BERMS AS PART OF THE DITCH CONSTRUCTION BUT IT WAS LEFT IN THIS AREA SCOTT WILL BE AFTER THE CONTRACTOR TO FIX IT NOT REALLY SURE IT IS OUR PROBLEM	No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
231	5810 W NAVAJO DR	MARY NEIMAN	BACK YARD FLOODED AND FILLED POOL WITH MUD AND WATER CLAIMS THE PROBLEM IS BECAUSE THE CITY RAISED THE LEVEL OF THE ALLEYS LAST YEAR		No	Yes	Olive Ave. SD should have resolved issue. Might need to construct the 59th Ave SD from Northern to completely solve problem.
232	71ST AVE @ MYRTLE	BARBARA ANAYA	WATER IS RUNNING OUT OF A DETENTION BASIN INTO HER HOME		No	Yes	Orangewood Ave. Storm Drain should have water volume and solved issue.
233	7102 N 68TH AVE	DALE DISNEY	GLEN FAIR APTS PROBLEM WITH WATER ENTERING ONTO THE PRPOERTY AND FLOODING THE APARTMENTS HAD UP TO 4' IN SOME UNITS STREETS CAME OUT AND DUG A DITCH AND PUT UP SANDBAGS BUT TOO LATE		No	Yes	Orangewood Ave. Storm Drain should have water volume and solved issue.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
234	5602 W NORTHERN AVE	RUBY STOCKTON	TOLBY THROUGH EGGLESTON REPORTED STREET FLOODING WHICH ENTERED ONTO LAWN	OLIVE AVE DRAIN WILL ALLEVIATE THE PROBLEM SOMEWHAT	No	Yes	Olive Ave. SD should have mitigated issue by reducing volume. Northern Ave. SD should resolve issue. Might need to have local storm drain constructed
235	8103 N 56TH AVE	JOHN HENRY	TOLBY THROUGH EGGLESTON REPORTED STREET FLOODING WHICH ENTERED ONTO HIS PROPERTY	OLIVE AVE DRAIN WILL ALLEVIATE THE PROBLEM SOMEWHAT	No	Yes	Olive Ave. SD should have mitigated issue by reducing volume. Northern Ave. SD should resolve issue. Might need to have local storm drain constructed
236	8322 N 55TH AVE	SANDRA TOMLIN	TOLBY THROUGH EGGLESTON REPORTED STREET FLOODING WHICH ENTERED ONTO HER PROPERTY	OLIVE AVE DRAIN WILL ALLEVIATE THE PROBLEM SOMEWHAT	No	Yes	Olive Ave. SD should have mitigated issue by reducing volume. Northern Ave. SD should resolve issue. Might need to have local storm drain constructed
237	17913 N 71ST DR	RICHARD CAROL	CALLED TO COMPLAIN ABOUT THE LAKE WHICH APPEARS IN FRONT OF HIS PLACE EVERYTIME IT RAINS WATER GETS HERE FROM THE STREET AND SINCE IT IS LOW DOESN'T GO AWAY HE COULDN'T GET INTO HIS HOUSE LAST MONTH DURING THE RAINS THINKS THE CITY SHOULD DIG A	THERE ISN'T MUCH THAT CAN BE DONE EXCEPT FOR DIGGING A DRYWELL BUT THE COST IS GOING TO BE HIGH HE SAYS IT IS ONLY $60-80 BUT I TOLD HIM IT WOULD BE MUCH MORE ($2500) HE IS NOT INTERESTED	No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
238	5738 W NORTHERN AVE	DENNIS PANGOWISKI	WATER IN NORTHERN BACKS UP INTO HIS DRIVEWAY AND FLOODS HIS HOUSE EVEN WHEN HE PUTS UP SANDBAGS THE WAVES FROM THE CARS FLOODS HIM OUT HE BUILT A BLOCK WALL AROUND HIS HOUSE BUT IT STILL COMES IN HIS DRIVEWAY		No	Yes	Olive Ave. SD should have mitigated issue by reducing volume. Northern Ave. SD should resolve issue. Might need to have local storm drain constructed
239	6444 N 67TH AVE	DAVE NEWPORT	WATER ACCUMULATES AT THE END OF 69TH AVENUE SOUTH OF MARYLAND AND DOESN'T GO AWAY FOR A LONG TIME HE HAS CALLED AND TALKED TO KEN VAYDA AND BROYLES TO GET THE PROBLEM RESOLVED IN DEC 1991 HE SAYS THE STREET IS BELOW THE SURROUNDING GROUND AND THERE		No	No	Future construction of the BH Rd. SD and 67th Ave. SD should solve problem
240	7001 W VILLA THERESA DR	MRS FRANK	WATER IN THE STREET EACH TIME IT RAINS SO THEY CAN'T GET TO THE MAILBOX ETC SHE CALLED AND COMPLAINED LAST SUMMER BUT I CAN'T FIND A RECORD OF HER CALL		No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
241	15808 N 63RD AVE	LAURA LAMBERTO-WHITE	WATER IN THE STREET EACH TIME IT RAINS SO KIDS CAN'T GET TO OR FROM THE SCHOOL WITHOUT WADING THROUGH THE WATER THE STREET AT THIS TIME IS COMPLETLY FULL OF WATER SUCH THAT THEY CAN'T GET ACROSS THE STREET THIS PROBLEM HAS BEEN ONGOING FOR THE 4 YEAR	CONST THE STORM DRAIN	No	Yes	City resolved the problem
242	SE COR 66TH & GREENWAY	MICHELL HILL	WATER CAME INTO HER PROPERTY THROUGH THE WALL (GATE) AND INTO HER HOUSE THE CONTRACTOR IS BLAMING THE CITY STATING THAT WE REQUIRED CERTAIN THINGS TO BE DONE TOLD HER WE DIDN'T HAVE MUCH OF ANYTHING TO DO WITH WALLS SO BETWEEN HER AND HER BUILDER	TOLD HER WE SOMETIMES INSPECT PROPERTY BUT THE BUILDINGS ARE SUPPOSE TO BE CONSTRUCTED ABOVE ADJACENT CURBS LONG RANGE PLANS ARE TO CONST DRAIN IN GREENWAY ROAD WHICH WILL HELP	No	Yes	Street improvements to 67th Avenue and channel improvements around high school should have resolved problem.
243	7024 W KRALL	DANIELLE KOILE	THE WATER IN THE DETENTION BASIN AT 71ST AND MARYLAND HAS WATER WHICH STANDS FOR SEVERAL WEEKS EACH TIME IT RAINS THE WATER FROM THE RAINS LAST MONTH IS STILL THERE AND 12-18" DEEP WATER IS VERY SMELLY AND GROSS		No	Maybe	Sounds like a maintenance problem.
244	5220 N 51ST AVE	WARREN HACKETT	WATER ENTERS THE CALCOT PROPERTY OFF 51ST AVENUE AND FILLS THEIR DEPRESSED SPUR TRACK WATER ENTERS THE BOX CARS PARKED ON THE SPUR AND DOESN'T ALLOW THE LOADING AND UNLOADING OF MATERIALS ALSO CREATES PUMPING COSTS WHICH NEED TO BE PAID FOR	COULD BUILD BERM ACROSS THE TRACKS TO DEFLECT THE WATER DOWN THE SPUR AWAY FROM THE DEPRESSED AREA SIMILAR TO WHAT WAS DONE IN THE PAST PROBLEM IS ON THE PRIVATE PROPERTY AND NOTHING THE CITY CAN DO	Yes	No	Camelback Storm Drain will resolve this problem together with a drain in 51st Ave.
245	6612 N 82ND AVE	VANDERVELD	THE DETENTION BASIN IS NEARLY FULL AND ALMOST READY TO GET INTO THEIR HOUSE HAD TALKED TO SOMEBODY EARLIER AND THEY WERE ABOUT TO PUMP OUT THE BASIN TOLD HIM IT WOULD BE DONE		Yes	Yes	Maryland street improvements completed and believe outfall across Maryland to another basin was constructed.
246	6740 W MONTEBELLO	MIKE GRADY	THERE IS A FLOODING PROBLEM		No	No	Construction of the Camelback SD and 67th SD are needed to solve problem. The BH Rd. SD will reduce the water to the area.
247	6815 W BETHANY HOME RD		MANAGER SAYS THE WATER FROM THE STREET IS GETTING ONTO HIS PROPERTY AND CREATING A PROBLEM CITY HAS WORKED ON THIS IN THE PAST BUT NOTHING DONE TO SOLVE PROBLEM	TOLD HIM PROBLEM COULD ONLY BE SOLVED WITH A STORM DRAIN BUT SEVERAL YEARS AWAY	Yes	No	BH Rd. SD will solve problem
248	6913 W GREENWAY RD	JESUS TORREZ	WATER IS INTO HIS HOUSE 1 FEET DEEP CITY WORKED ON THE PROBLEM IN THE PAST BUT THE WATER WENT AROUND THE BERM THIS TIME		No	Yes	SD improvements in Greenway should have improved issue.

ID	ADDRESS	NAME	PROBLEM	SOLUTION	COMP.	Clear	2010 Comments
249	7006 N 76TH DR	JACK WILLIAMS	PROBLEM IS POOR DESIGN 2 YEARS AGO ON GLENDALE AVE WHICH CAUSED HIM TO HAVE ALL THE PROBLEMS WAS ASSURED BEFORE THAT PROBLEM WASN'T THE DESIGN HE CAN'T GET FLOOD INSURANCE 2 YEARS AGO HAD WATER INTO HIS HOUSE NO PROBLEM FOR 18 YEARS BEFOR WORK		No	Maybe	Orangewood SD should help reduce water volume and Glendale Street improvements should help relieve problem.
250	71ST AVE @ MYRTLE	JIM BORN	THE DETENTION BASIN IS NEARLY FULL AND WATER IS BACKING INTO THE STREETS AND ONTO PROPERTY	TOLD HIM I WOULD CALL PARKS MAINTENANCE AND HAVE THE BASIN PUMPED	Yes	Yes	Orangewood Ave. Storm Drain should have water volume and solved issue.
251	7422 W MARYLAND	LINDA TATUM	THERE IS A SERIOUS PROBLEM AT 75TH AND MARYLAND WHERE THE WATER CAN'T GET OUT OF THE DRAINAGE CHANNEL NEAR THE CEMETARY WATER ISN'T IN HER HOUSE AT THIS TIME BUT HAS BEEN IN THE PAST	TOLD HER ABOUT THE STORM DRAIN IN THE FUTURE BUT NO MAJOR HELP FOR SOME TIME	No	No	The street improvements to 75th Ave. should have helped but storm drain is needed to resolve issue.
252	6944 N 67TH AVE	DAVID NEWPORT	FLOODING ON PROPERTY AND IN STRUCTURE	NO SOLUTION WITHOUT STORM DRAIN	Yes	No	BH Rd. SD and 67th Ave SD will solve problem
254	14058 N 61ST AVE	STEVE EVANS	STORM WATER CAUSED SEWER BACKUP		No	Yes	Not storm drain issue. SD improvements in Greenway should have improved issue.
255	4508 W GARDENIA	MRS MATCHNAR			No	No	Northern Ave. SD should reduce water volume. Future extension of storm drain in Glendale up 47th should help.
256	5120 W NORTHERN AVE	NICK IALENTI			No	Yes	Northern SD should solve problem
257	7011 W VILLA THERESA DR	MRS KENNIS			No	Yes	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved.
258	7202 N 45TH AVE	LAURA DEUTSCH	FLOOD WATER HAS CAUSED SEWER TO FLOW INTO HOUSE THROUGH THE SHOWER		Yes	No	Northern Ave. SD should reduce water volume. Future extension of storm drain in Glendale up 47th should help.
259	7510 N 45TH AVE	JIM PASQUARETTE	HAS HAD 8" OF SEWER WATER IN HIS BASEMENT THE WATER CAME UP THROUGH THE SHOWER AND TOILET HIS NEIGHBOR (GILLIAN'S) HAD SIMILAR PROBLEM WITH RAW SEWAGE	PROBLEM WAS SOLVED BY FIXING THE SEWER AND INSTALLING CHECK VALVES	Yes	No	Northern Ave. SD should reduce water volume. Future extension of storm drain in Glendale up 47th should help.
260	5526 E NORTHERN AVE	MRS SMITH	THE WATER IN NORTHERN AT 55TH AVENUE IS SO DEEP THEY CAN'T GET IN OR OUT OF THE DRIVEWAYS SHE SAYS THE PROBLEM WASN'T SEVIER UNTIL THEY CLOSED OFF THE FRONTAGE ROAD SHE THINKS IT IS CRIMINAL THAT THE CITY HASN'T DONE SOMETHING ABOUT IT YET	CONST STORM DRAIN	No	Yes	Construction of the Northern Ave SD should solve problem.
261	71ST AVE @ MISSOURI	MRS BURN	WATER IS IN THE STREET AROUND CENTENNIAL PARK SUCH THAT THE KIDS HAVE TO STAND IN OR WALK THROUGH 6" OF WATER TO GET TO THE BUS TOLD HER I WOULD LOOK INTO IT AND SEE IF THERE ISN'T SOMETHING WHICH CAN'T BE DONE		No	No	BH Rd. SD should reduce water volume and mitigate issue.
262	90TH AVE @ ROSE LN	MARY ANN BARABAN	WATER IN THE STREET CAN'T GET INTO THE BASIN BECAUSE OF GRASS AND DEBRIS BLOCKS THE DRAINAGE SWALE TALKED TO A MAINTENANCE WORKER ABOUT DIGGING OUT A CHANNEL AND THEY SAID THEY WOULD CONTACT SOMEBODY	CONSTRUCT APRON AT BACK OF WALK	No	Maybe	Think the 91st Ave. street improvements should have helped problem. Storm Drain in Glendale Ave. should have reduced water volume.
263	6526 W Villa Theresa Dr	Gary & Mary Davis	Water came in through a hole in their block wall in Union Hills Drive which filled their pool with mud There is a low spot against the wall which ponds water and creates the problem The low spot is probably due to the erosion of the soil onto their	Suggested they fill the holes in the fence and we will look into placing dirt into the area between the wall and the curb to eliminate the ponding	No	No	This is always a problem with heavy rain and the houses are all lower than Union Hills Drive. Storm Drain in UH Dr. could help.
264	7230 W Grovers	Mrs Fransens	Water is entering house from the street She has never had this problem before Located near 75th and Bell Road		No	Maybe	The 71st Ave. drainage channel was improved and the openings to drain the streets were improved. Problem is no street improvements and owners use river rock to landscape which blocks whatever drainage might occur.
265	18402 N 70TH AVE	PEGGY FARREL	The neighbor has constructed a block wall within the easement which is causing flooding problems	Refered the matter to Code Enforcement	No		There are no curbs or other improvements which were built under county jurisdiction. People have built block walls etc which are in violation of the restrictions on the plats.
266	6701 W Sherrie Jean	John Perkins	Water comes in off of the street which flooded their shed Claims that it has never happened in their 11 years they lived there Mentioned that the contractor added some material to the front of their property to fill a low area	Construct the swale and berm along their property line Refered to Construction Engr to be sure the work is done	No	Yes	67th Ave Street improvements resolved the issue.
267	61ST ave @ BELL rd	JOE DEKARIA	WATER FROM BELL ROAD ENTERS PROPERTY AND THREATENS WALL ON THE EAGLE CREST APARTMENTS THE CITY CONSTRUCTED A BERM 2-3 YEARS AGO WHICH WORKS WELL BUT THE RECENT CONSTRUCTION BY APS AND OTHERS AT THE PET BOY'S STORE HAS REMOVED THE BERM	CONSTRUCT THE BERM HAVE CONTACTED APS AND THE CITY INSPECTORS TO LOOK INTO RESTORING THE BERM IF THAT DOESN'T WORK WILL CONTACT THE CITY SHOPS	No	Maybe	Think problem was resolved. Main problem was very heavy rain.

Flooding Issues based on Maryvale Area Drainage Master Study and Glendale Peoria Aread Drainage Master Plan Update

Study	Issue Number	Major Area	Street Boundaries	Comments
Maryvale	RES26E	Grand Avenue	I-17 (E), Grand Ave (SW), Earl Drive (N)	
Maryvale	RES8	Grand Avenue	Northwest side of the 51st and Bethany Home Road Intersection	ADOT construction of 51st Ave Overpass mitigated flooding
Maryvale	RES6	Grand Avenue	Northern Ave (N), Grand Ave (SW), 63rd (W)	Storm Drain and ADOT construction of storm drain mitigated flooding
Maryvale	RES36	Grand Avenue	South of Olive Avenue along the NE side of Grand Avenue	ADOT enlarged retention / detention basin
Maryvale	RES26S	Grand Avenue	Olive Ave (S), Mountain View Rd (N), Grand Ave (SW), 75th Ave (E)	ADOT enlarged retention / detention basin
Maryvale	RES26N	Grand Avenue	North of Mountain View Road along Grand Ave, South of Peoria Ave	
Maryvale	RES22	Grand Avenue	Along Grand Ave, lying north of the Peoria and 83rd Ave Intersection	
Maryvale	RES26T	Grand Canal	Northwest side of the intersection of Grand Canal and Grand Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA43	Grand Canal	Along north side of the canal from approximately 36th Avenue to 59th Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA47	Grand Canal	Along north side of the canal from approximately 36th Avenue to 59th Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA51	Grand Canal	Along north side of the canal from approximately 36th Avenue to 59th Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA55	Grand Canal	Along north side of the canal from approximately 36th Avenue to 59th Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA59	Grand Canal	Along north side of the canal from approximately 36th Avenue to 59th Avenue	Part of Bethany Home Outfall Channel Improvements
Maryvale	PA63	Grand Canal	Indian School Road at intersection with Grand Canal	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES24N	Grand Canal	67th Ave (E), Camelback Rd (N), and the Grand Canal (SW)	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES14E	Grand Canal	South of Bethany Home Rd along Grand Canal	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES10	Grand Canal	87th Ave (E), Grand Canal (S), 91st Ave (W), Rovey Ave (N)	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES9	Grand Canal	Northeast side of the intersection of 99th Ave and the Canal	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES8S	Grand Canal	North side of Canal between 99th Avenue and the RIG	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES8N	Grand Canal	Northeast side of irrigation canal upstream of the outfall to New River	Part of Bethany Home Outfall Channel Improvements
Maryvale	RES33	Roosevelt Irrigation District	North side of the Canal, parallels Mcdowell Road between 91st and 99th Ave	Not a lot of Public comment because of not a lot of development
Maryvale	RES32E	Roosevelt Irrigation District	Holy Cross Cemetery, South of Thomas Road between 100th Ave and the North Canal	Not a lot of Public comment because of not a lot of development
Maryvale	RES29S	Roosevelt Irrigation District	Thomas Rd (S), 100th Ave (E), RID Canal (W), Osborn Rd (N)	Not a lot of Public comment because of not a lot of development
Maryvale	RES29W	Roosevelt Irrigation District	Area east of RID, along east side of 107th Ave and North of Canal at approx. Osborn Rd	Not a lot of Public comment because of not a lot of development
Glendale-Peoria	1	ACDC	North Side of ACDC	Nearby subdivisions discharging to the ACDC. Surcharges of existing facilities
Glendale-Peoria	2	New River	91st Avenue and Greenway channels to the New River	91st Avenue and Union Hills, ultimately conveyed to 91st Avenue channel. Storm drain constructed. Greenway channel cannot handle 100-year flows
Glendale-Peoria	3	New River	91st Avenue to the Agua Fria River along Beardsley Road, 115th Avenue and Bell Road	Channel at 115th Avenue is restricted at the inlet into Coyote Lakes golf course. Berms were placed to divert flow to the south with no anticipation
Glendale-Peoria	4	New River	83rd Avenue to the New River north of Beardsley Road	Piecemeal development coupled with a lack of a joint drainage plan between Maricopa County and Peoria. Concentrated flows around existing developments without ultimate discharge points. Substantial offsite flows from the upstream-undeveloped areas.
Glendale-Peoria	5	new River	Rock Springs Creek	Mining Operation was established that cutoff the historical flowpaths. Flow spread over a wide area that will ultimately be developed.
Glendale-Peoria	6	Sun City	Channel along north side of Grand Avenue	Community of Sun City was designed prior to most of the current flow retention policies. Channel needs to be re-examined
Glendale-Peoria	7	Sun City	Drainage along 99th Avenue and Bell Road to the Agua Fria River	Stormwater runoff in excess of the 99th Avenue channel capacity spills into the streets and the other areas of Sun City near 99th Avenue and Del Webb Boulevard
Glendale-Peoria	8	New River	Beardsley Drainage Channel between Lake Pleasant Road and 107th Avenue	Ventana lakes development on the north side of Beardsley Road were originally designed to provide storage for storm runoff. Lakes are usually kept too full. Minor storm events overtop the lakes.
Glendale-Peoria	9	New River	Pinnacle Peak Road between 67th Avenue and the New River	Repeated flooding problems in the subdivisions located south of Pinnacle Peak Road, east of New River. Flows are interecepted by elevated lots.
Glendale-Peoria	10	New River	Wier Wash	Wash has been completely replaced by a man-made channel from Jomax Road. This channel was constructed as part of the Terramar subdivision
Glendale-Peoria	11	New River	87th Avenue and Williams Road	Old irrigation ditch along Williams Road was filled in and the banks are now higher than the roadway. Wiliams Road ponds behind the ditch and floods the roadway.