

**PEORIA STORM DRAIN  
MASTER PLAN**

**EXECUTIVE SUMMARY**

**Project # EN00139**

**January 2014**

Prepared by:

*Intelligent Engineering*  
*Innovative Solutions*



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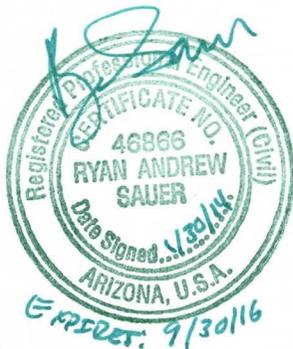
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# PEORIA STORM DRAIN MASTER PLAN

## PROJECT # EN00139

### SECTION 1. EXECUTIVE SUMMARY

#### 1.1 INTRODUCTION

The information and analysis presented in this report are part of the scope of work performed by Entellus Inc. under contract with the City of Peoria. The City of Peoria initiated the project to develop a strategy for planning and implementing solutions that address drainage issues within the study area. The City of Peoria and the Flood Control District of Maricopa County (FCDMC) partnered to provide funding for this project.

The purpose of this Executive Summary Report is to present and summarize the results of the Peoria Storm Drain Master Plan (SDMP). In addition, this report documents the approach used to arrive at the preferred alternatives and presents the pre-design solutions for the drainage issue areas.

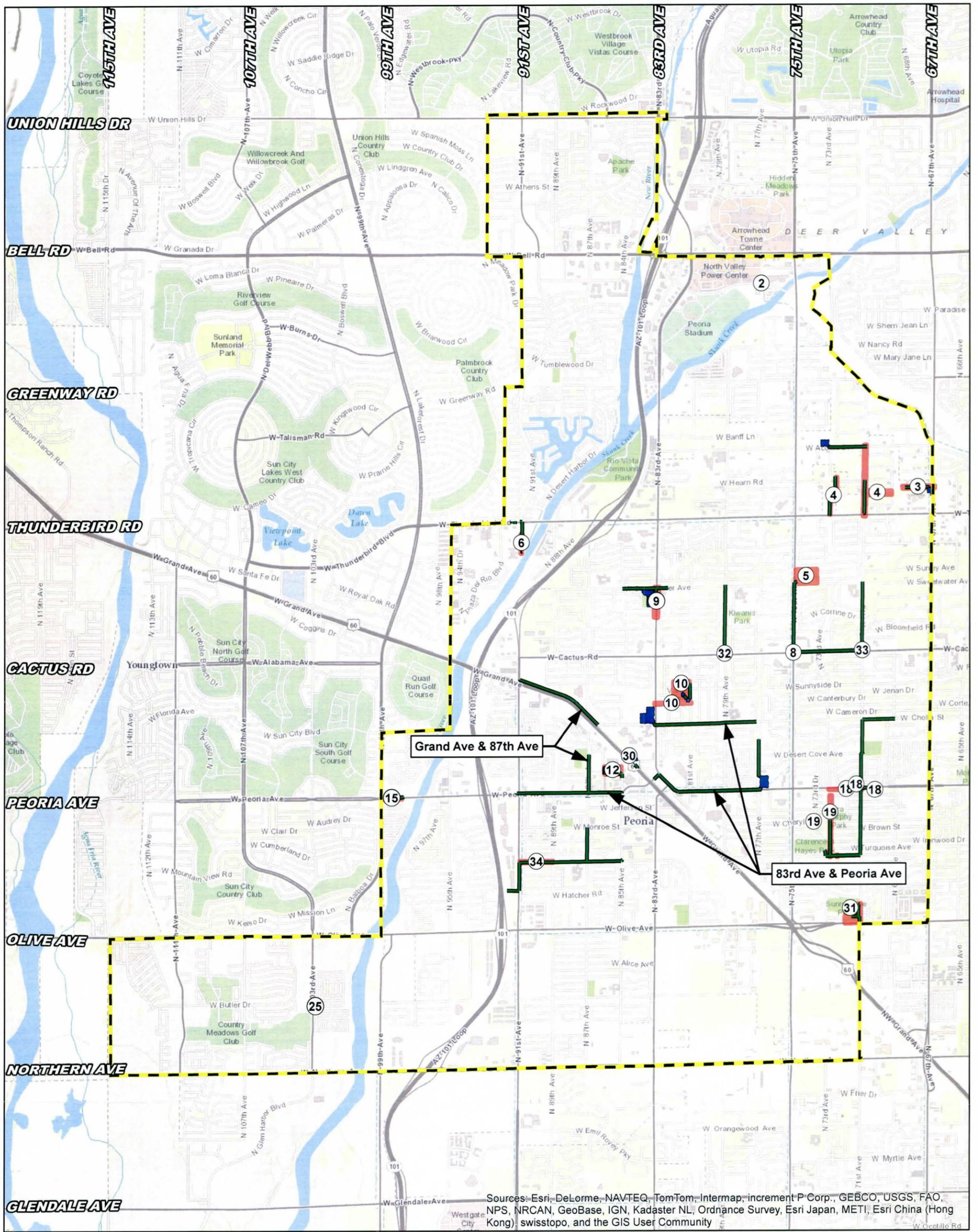
##### 1.1.1 Background

The City of Peoria initiated the Peoria SDMP to update the original study that was completed in 1988. Since the original Storm Drain Master Plan was completed, many changes have occurred within the study area and the contributing watershed. These changes are mostly associated with the increase of residential developments in the recent years. In addition, the City has continued to upgrade and has completed several improvements to its storm drain system. The City of Peoria needed to evaluate its current storm drain networks and address the existing known drainage issues to prevent flood damage.

##### 1.1.2 Study Areas

The overall study area for the Peoria SDMP is approximately 23 square miles consisting almost entirely of fully developed urban area. There are a few undeveloped areas (mostly active agricultural fields) located in the southeastern portion of the study. As shown in **Figure 1.1 – Study Area**, the study's focus is on drainage issues in the area south of Union Hills Drive, within the jurisdictional limits of the City of Peoria. The study area also includes the entire respective contributing watersheds to this focus area, without regard to the City limits in order to analyze potential drainage issues within the focus area.

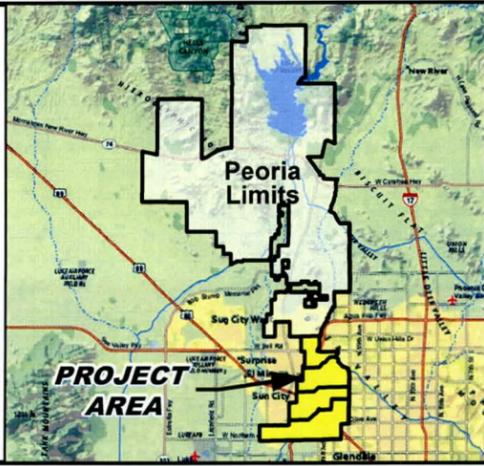
This study focuses on the areas south of Union Hills Drive because no recent drainage master plan addresses this area and the existing drainage improvements in the area were developed based on outdated standards.



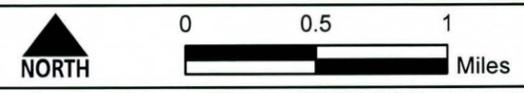
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

LEGEND

-  Recommended Storm Drain
-  Recommended Retention Basin
-  Drainage Issue/Problem Areas
-  Project Boundary



**CITY OF PEORIA  
PEORIA STORM DRAIN  
MASTER PLAN**



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**FIGURE 1.1  
STUDY AREA**

### 1.1.3 Purpose and Goals

The City of Peoria initiated the Peoria SDMP to update the original study that was completed in 1988. Since the original Storm Drain Master Plan was completed, many changes have occurred

The main purpose of this study is to quantify the existing drainage issues and develop feasible solutions. This is accomplished by evaluating the existing storm drain system, reviewing the existing hydrology flows, quantifying the drainage issues, developing alternative solutions, selecting the most feasible alternative and preparing conceptual design plans (15%) for the preferred alternatives. The major project tasks included the following:

The goals mentioned above were documented as part of the following project tasks:

1. **Data Collection:** Develop a comprehensive collection of studies, reports, and other information that is relevant to identifying and resolving drainage issues.
2. **Facilities Inventory:** Update the City's facility inventory database to include missing storm drain information.
3. **Hydrology:** Update the hydrologic models from the *Glendale Area Stormwater Management Plan* and modify the models for use as the base models for identifying drainage issues and developing alternatives.
4. **Hydraulics:** Prepare a hydraulic model for all storm drains that are 24-inch or larger within the study area.
5. **Existing Drainage Issues:** Utilize data collection, facilities inventory, hydrology, hydraulics, and drainage issue information provided by the City to identify and evaluate existing drainage issues.
6. **Alternatives Development:** Develop and evaluate potential solutions to the identified drainage issues.
7. **Recommended Plan:** Select and prioritize solutions (projects) to identified drainage issues and provide conceptual design plans and cost estimates.
8. **Operations and Maintenance Guidelines:** Develop a set of guidelines that summarizes the appropriate maintenance activities for all existing and future drainage facilities within the City.
9. **Stormwater Pollution Management Review:** Review the current City Stormwater Management Plan (SWMP), Municipal Separate Storm Sewer System (MS4) permit, and the existing city code to determine if City has the proper authority to enforce regulations set forth by their MS4 permit and SWMP.

## 1.2 RECOMMENDED ALTERNATIVES

A list of areas prone to flooding was identified and compiled by City staff prior to the start of this project. These areas were identified based on private property flooding

complaints, input from City roadways maintenance team (maintenance hot spots), and hydrology/hydraulic analysis results. Furthermore, a preliminary selection process was performed at the start of this task to identify the drainage issues that would be analyzed as part of the alternative formulation and evaluation process. During the preliminary selection process all the drainage issues that were already resolved or were being addressed under different projects were identified and were not studied further.

### 1.2.1 Process for Recommending Alternatives

Several drainage alternatives were developed for a total of 20 flood prone areas. Alternatives were formulated to include a variety of measures to mitigate the Drainage Issues by means of collecting, conveying and storing storm water runoff. The measures include storm drains, regional detention basins, channels and roadway re-grading.

The development of the alternatives included hydrologic and hydraulic analysis, an evaluation of the existing facilities, preliminary cost analysis, and the impact of the alternative infrastructure on the existing storm drain system.

The project team from the City of Peoria, FCDMC and Entellus conducted a workshop to select the preferred alternative for each drainage issue. An evaluation matrix was utilized during the workshop to help select the most feasible solution for each Drainage Issue. This alternative then became the preferred alternative.

### 1.2.2 Recommended Alternatives Description

To facilitate the drainage alternatives formulation and evaluation process, the study area was divided into 4 (four) drainage problem areas. The recommended alternatives for each drainage issue area are described below.

#### 1.2.2.1 Problem Areas 1 and 2

##### **Drainage Issue No. 2 – 77<sup>th</sup> Avenue and Paradise Lane**

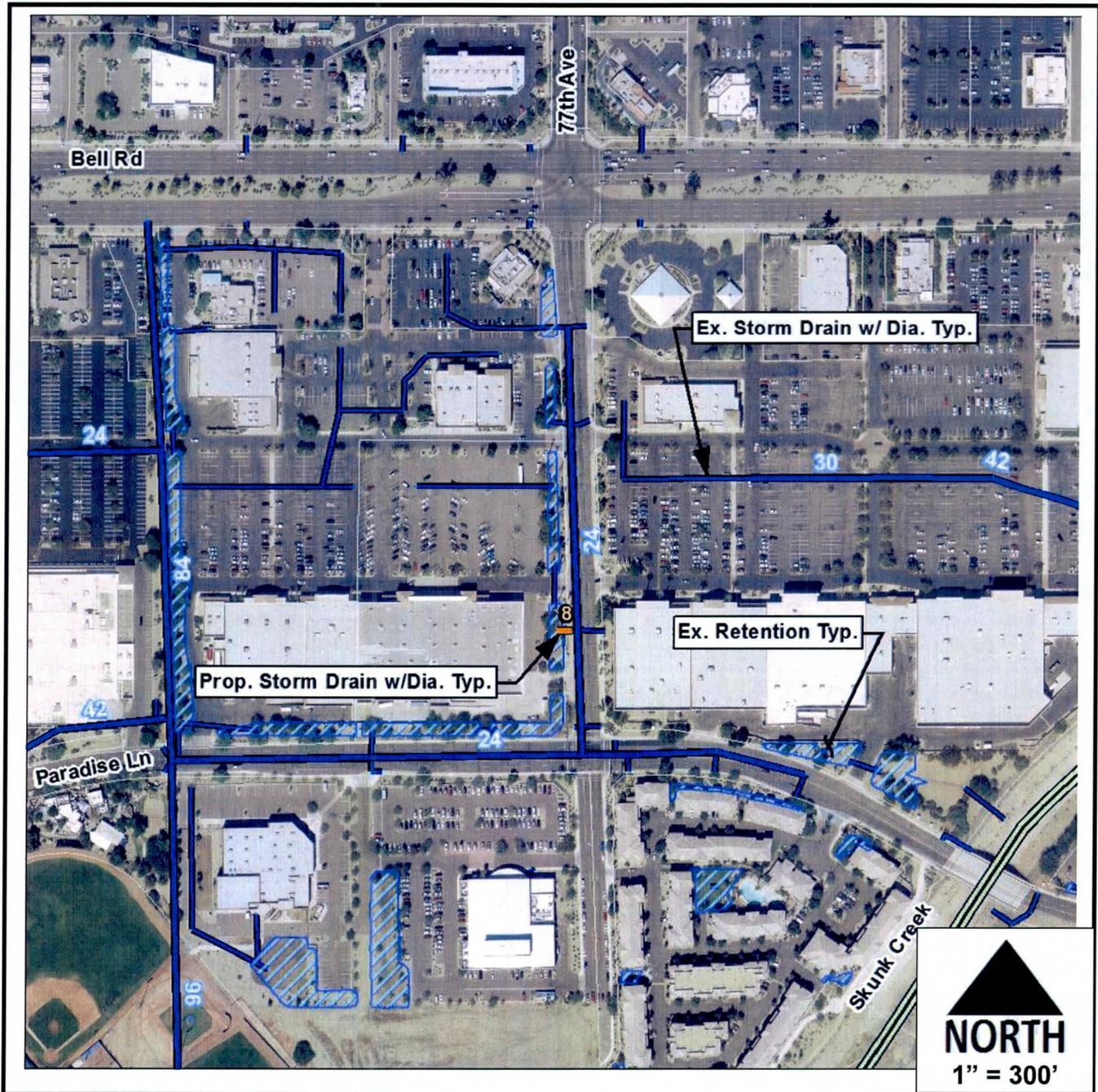
Drainage Issue No. 2 is located at the intersection of 77<sup>th</sup> Avenue and Paradise Lane. During significant storm events, storm water runoff accumulates at the intersection of Paradise Lane and 77<sup>th</sup> Avenue and drains very slowly.

This alternative includes reducing the capacity of the storm drain inlet that drains a portion of Arrowhead Crossing Commercial Center parking lot into the 24-inch storm drain along 77<sup>th</sup> Avenue. This particular inlet is located along 77<sup>th</sup> Avenue approximately 250 ft north of Paradise Lane and is connected to the 24-inch storm drain via a 15-inch lateral pipe. This alternative would downsize the 15-inch storm drain lateral to 8-inch and limit the discharge from the parking lot to the 77<sup>th</sup> Avenue storm drain to 1 cfs. Proposed drainage facilities, costs, advantages, and disadvantages are shown on **Figure 1.2 – Drainage Issue No. 2 Preferred Alternative** below.

Figure 1.2 – Drainage Issue No. 2 Preferred Alternative

Drainage Area: 1 \_\_\_\_\_

Drainage Issue ID: 2 \_\_\_\_\_



**Cost**

• Construction .....	\$ 4,100
• Right-of-Way .....	\$ 85
• Annual Maintenance .....	\$ 70

**Advantages**

- No right of way acquisition.
- Minimizes impact to existing parking lot facilities.
- Reduces flooding of the roadways.
- Low construction cost.

**Disadvantages**

- Requires that more storm water be retained on the parking lot on the west side of 77<sup>th</sup> Ave.
- May increase pavement maintenance cost of parking lots for Arrowhead Crossing Commercial Center.
- Ponding will remain on the parking lot for a longer time.

### **Drainage Issue No. 3 – Redfield Road West of 67<sup>th</sup> Avenue**

Drainage Issue No. 3 is located along Redfield Road, an 1100 ft long roadway west of 67<sup>th</sup> Avenue and north of Thunderbird Road. During significant storm events the roadway and adjacent properties often flood. The Peoria Heights Ranch Estates was designed as a low density, flood irrigated lots and built in 1978. Redfield Road was not design to carry any flow but to drain into the lots. Currently, the front portion of most of the lots drain to the street and since the street does not have a positive grade to drain or a curb to contain the flow in the street, the runoff ponds in the street and any low area adjacent to the street.

The preferred alternative consists of installing a storm drain along this stretch of Redfield Road and placing catch basins to collect street flow. The proposed storm drain would outfall into a new retention basin located on the empty lot at the southwest corner of Redfield Road and 67<sup>th</sup> Avenue and be drained via drywells. As an optional method of draining the retention basin, there is the potential to install a 24-inch connection to the 67<sup>th</sup> Avenue storm drain that is owned by the City of Glendale. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.3 – Drainage Issue No. 3 Preferred Alternative** below.

Figure 1.3 – Drainage Issue No. 3 Preferred Alternative

Drainage Area: 2 \_\_\_\_\_

Drainage Issue ID: 3 \_\_\_\_\_



**Cost**

- Construction ..... \$ 460,000
- Right-of-Way ..... \$ 51,000
- Annual Maintenance ..... \$ 3,300\*

\* Reduce ponding may result in reduction of maintenance cost for the street. This potential savings is not included in this cost

**Advantages**

- Provides 10-year level of protection along the storm drain alignment.
- Resolve access problem during normal storm events.
- Provides multi use opportunity for the neighborhood.
- Minimize disturbance to adjoining properties along Redfield Rd.

**Disadvantages**

- Requires acquisition of private property.
- Construction traffic disturbance on Redfield Road.
- Additional maintenance cost for new basin
- Requires drywell or bleed off to drain basin

**Drainage Issue No. 4 – 72<sup>nd</sup> Avenue & Redfield Road - Weedville Well Waste Discharge**

Drainage Issue No. 4, located on 72<sup>nd</sup> Avenue and Redfield Road, is associated with several flooding issues. These include the waste discharge from the Weedville well, runoff ponding around the well site, flooding of the property to the west of 73<sup>rd</sup> Avenue, runoff through property on the north side of Thunderbird Road at 73<sup>rd</sup> Avenue and flooding along 72<sup>nd</sup> Avenue from Thunderbird Road to Acoma Drive.

The preferred alternative consists of three main elements:

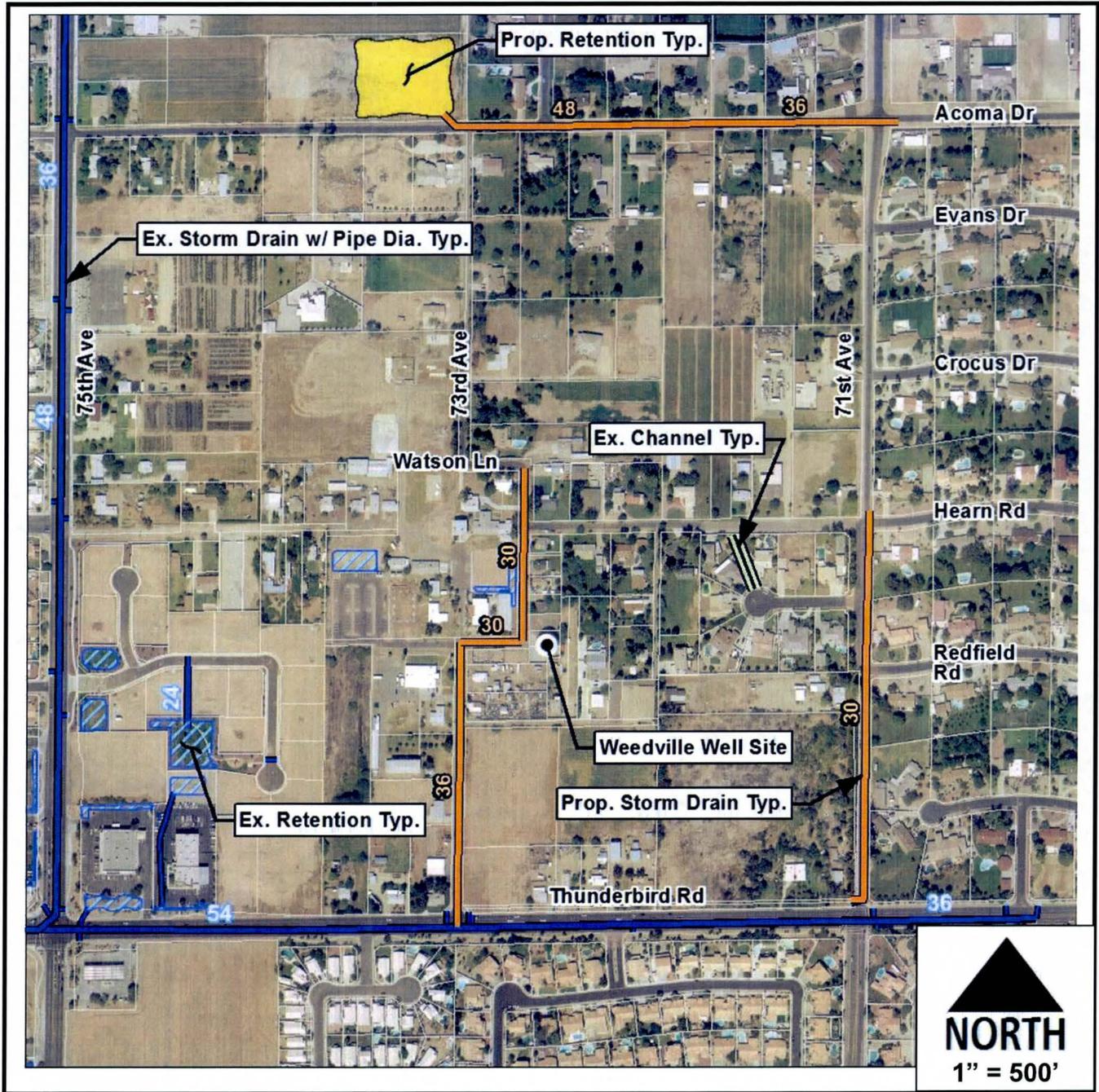
- Storm drain along Acoma Drive from 71<sup>st</sup> Avenue out falling to a proposed basin in the northwest corner of Acoma Drive and 73<sup>rd</sup> Avenue. Optionally, alternate locations that provide the same drainage benefits could be considered for the retention basin proposed as part of this alternative. Also, as part of this option, consider a bleed-off connection to the 75<sup>th</sup> Avenue storm drain.
- Storm drain along 72<sup>nd</sup> Avenue (Watson Lane to Redfield Road), storm drain along Redfield Road (72<sup>nd</sup> Avenue to 73<sup>rd</sup> Avenue), and storm drain on 73<sup>rd</sup> Avenue from Redfield connecting to the existing 54-inch storm drain on Thunderbird Road.
- Storm drain along 71<sup>st</sup> Avenue from Hearn Road connecting to the existing 54-inch storm drain on Thunderbird Road (modified Master Plan element).

In addition, this alternative may require re-grading along the shoulders of the roadways and installing proposed area inlets to direct flows to the storm drains. Alternately, curb and gutter could be installed to direct the flows to catch basins then into the storm drains. This alternative would provide an outfall for the waste discharge from the Weedville well site. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.4 – Drainage Issue No. 4 Preferred Alternative** below.

Figure 1.4 – Drainage Issue No. 4 Preferred Alternative

Drainage Area: 2 \_\_\_\_\_

Drainage Issue ID: 4 \_\_\_\_\_



**Cost**

• Construction .....	\$ 1,735,100
• Right-of-Way .....	\$ 170,000
• Annual Maintenance .....	\$ 30,000

- Advantages**
- Provide 10-year level of protection along storm drain alignments.
  - Provide outfall for the Weedville well waste discharge.
  - Improves access to the area during storm events.
  - Reduces flows reaching the Thunderbird Road storm drain.
  - Multi-use opportunities for basin site.

- Disadvantages**
- Traffic disturbance during construction.
  - May have some negative impact to the 75th Ave storm drain.
  - May require roadside ditches or curb to direct flow to catch basins.
  - Large basin on Peoria Unified school district property.
  - Requires additional maintenance.

### **Drainage Issue No. 6 – 91<sup>st</sup> Avenue and Thunderbird Road**

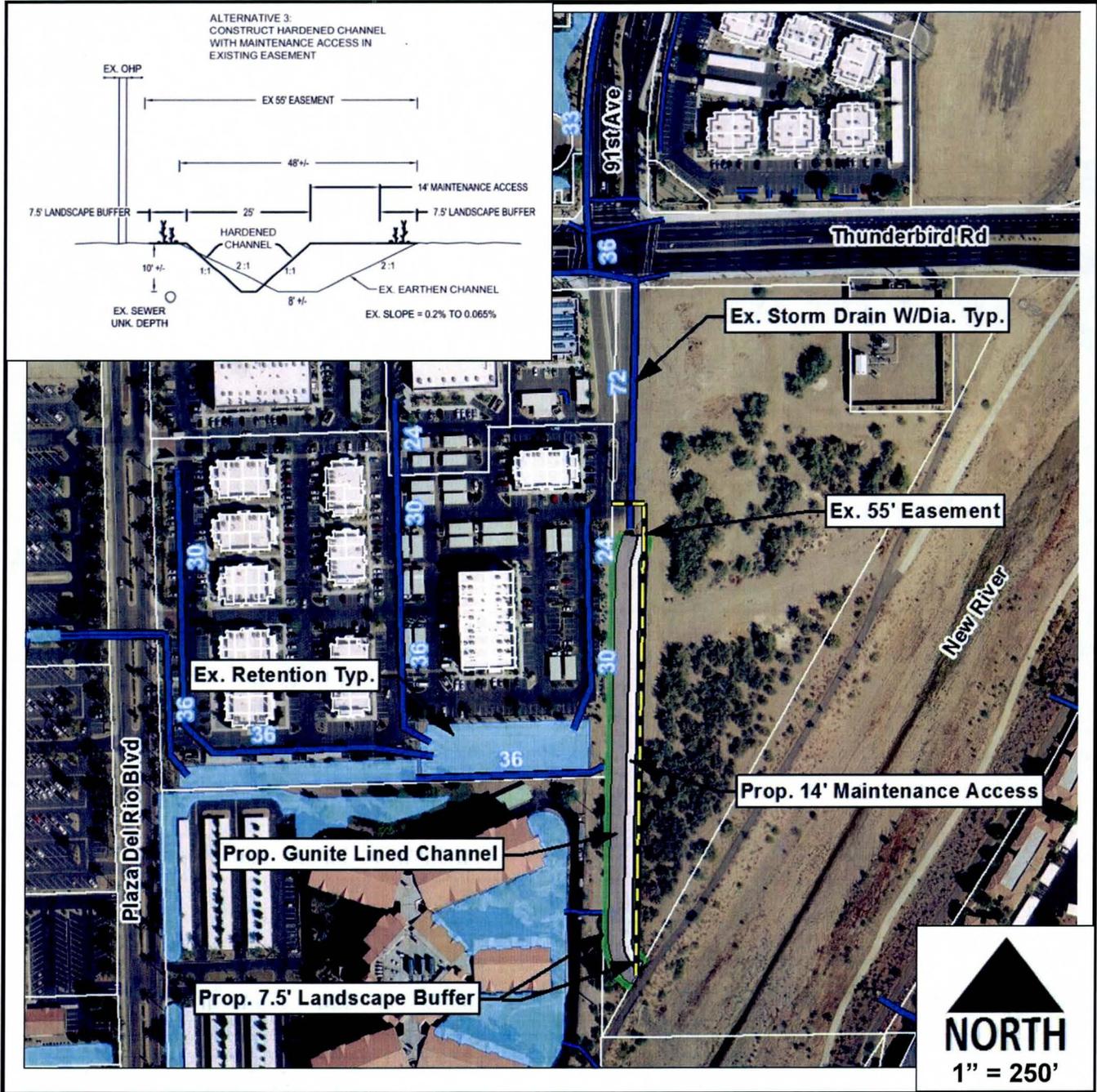
The 91<sup>st</sup> Avenue Outlet Channel between the south property line of the Plaza Town Center development and the culvert outlet to the New River has not been maintained as it cannot be easily accessed and is full of vegetation and debris that is reducing the channel capacity. The channel's current capacity could carry somewhere between the 10-year and 25-year flows. However, if left unmaintained, debris and vegetation will continue to accumulate and will reduce the channel's capacity. Ultimately, the channel could be completely obstructed and flows could back-up and scour the channel banks, threatening the sewer line, power poles, and adjacent properties.

The preferred alternative consists of replacing the earthen channel with a hardened channel that has a narrower top width and maintenance access within the existing drainage easement. This alternative could provide conveyance for up to the 100-year flows within the existing drainage easement. The channel could be configured in a variety of different ways, including additional storm drain or culvert crossing, depending on City and Developer preferences. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.5 – Drainage Issue No. 6 Preferred Alternative** below.

**Figure 1.5 – Drainage Issue No. 6 Preferred Alternative**

Drainage Area: 2 \_\_\_\_\_

Drainage Issue ID: 6 \_\_\_\_\_



**Cost**

• Construction .....	\$ 283,000
• Right-of-Way .....	\$ 0
• Annual Maintenance .....	\$ 2,100

**Advantages**

- Provides 100-year conveyance capacity.
- Allows for on-going maintenance.
- No property acquisition required.
- Intercepts overland flows.
- Provides erosion protection.

**Disadvantages**

- Relatively high construction costs.
- May not be aesthetically desirable.

### **Drainage Issue No. 6A – 91<sup>st</sup> Avenue and Thunderbird Road**

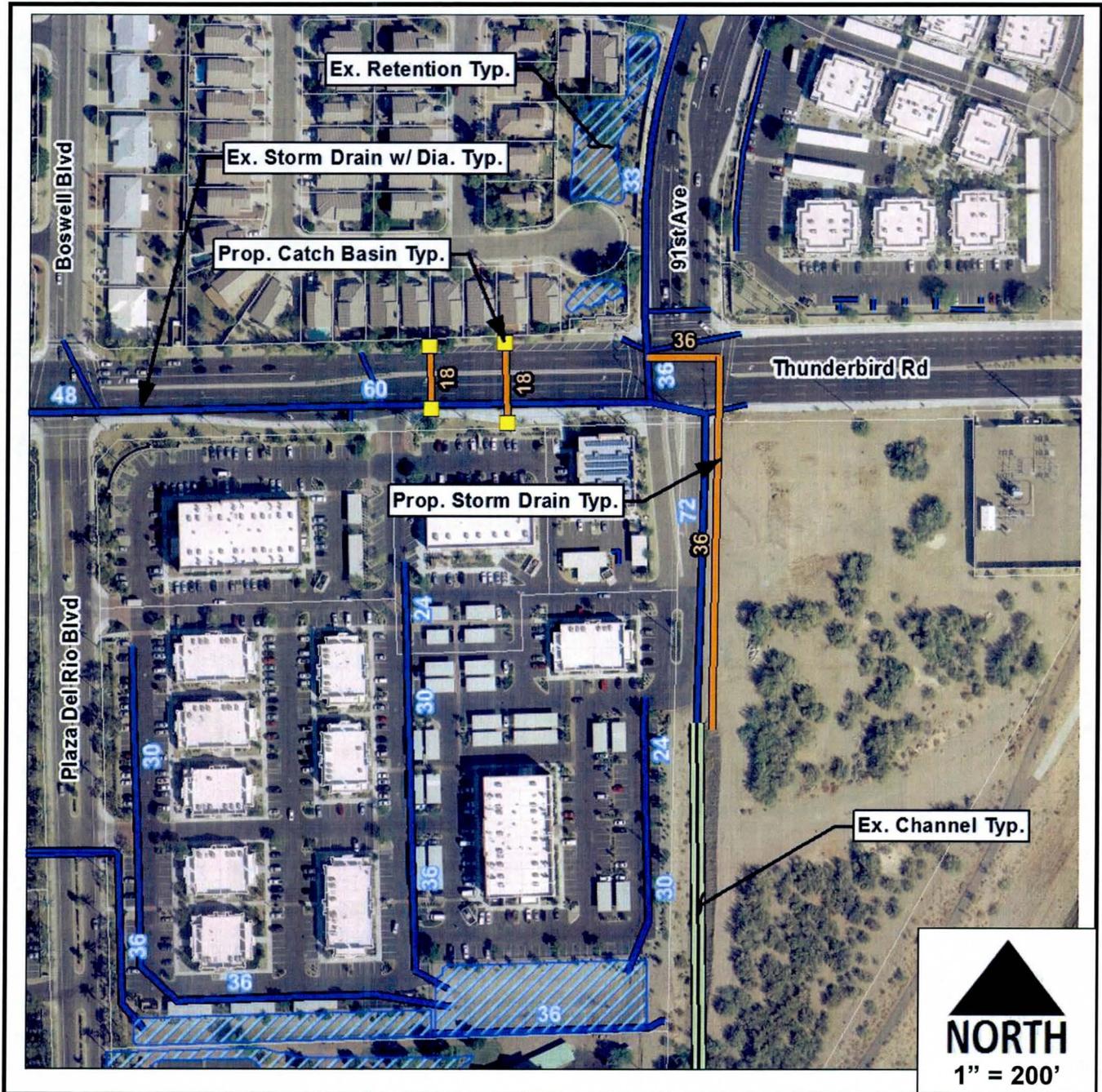
Hydrologic and hydraulic analysis performed as part of Drainage Issue No. 6 showed that during significant storm events flow magnitudes at the intersection of Thunderbird Road and 91<sup>st</sup> Avenue exceed the 72-inch storm drain capacity. Flows reaching the above mentioned intersection that exceed the capacity of the existing 72-inch storm drain will concentrate at the low point of the roadway and ultimately spill into the Plaza Town Center development before they would spill into the 91<sup>st</sup> Avenue Outlet Channel.

The preferred alternative consists of constructing a new 250 ft long channel along the east side of 91<sup>st</sup> Avenue that would drain into the existing 91<sup>st</sup> Avenue Outlet Channel. The proposed channel would have a bottom width of 6 ft, depth of 4.5 ft (including 1 ft of freeboard), side slope 3:1 and longitudinal slope of 0.2 percent. Variation of this alternative could include additional storm drain or culvert crossing, depending on the City and Developer preferences. In addition, the 36-inch storm drain pipe along 91<sup>st</sup> Avenue, north of Thunderbird Road will be extended to drain directly into the new drainage channel. To increase the inlet capacity of the 60-inch storm drain along Thunderbird Road, new catch basins will be added near the entrance of Town Plaza Center development. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.6 – Drainage Issue No. 6A Preferred Alternative** below.

Figure 1.6 – Drainage Issue No. 6A Preferred Alternative

Drainage Area: 2 \_\_\_\_\_

Drainage Issue ID: 6A \_\_\_\_\_



**Cost**

• Construction .....	\$ 188,000
• Right-of-Way .....	\$ 34,000
• Annual Maintenance .....	\$ 1,100

**Advantages**

- Reduces flooding of the roadways and adjacent property.
- Maximizes the use of existing drainage facilities.
- The lowest cost alternative.

**Disadvantages**

- Additional maintenance cost for new channel.
- Traffic disruption on Thunderbird Rd and 91<sup>st</sup> Ave.
- Requires the acquisition of an easement from the property at the southeast corner of Thunderbird Rd and 91<sup>st</sup> Ave intersection.

### 1.2.2.2 Problem Area 3

#### **Drainage Issues No. 5, 8, 32 and 33 – Sweetwater Park and Intersection of Cactus Road with 71<sup>st</sup>, 75<sup>th</sup> and 79<sup>th</sup> Avenues**

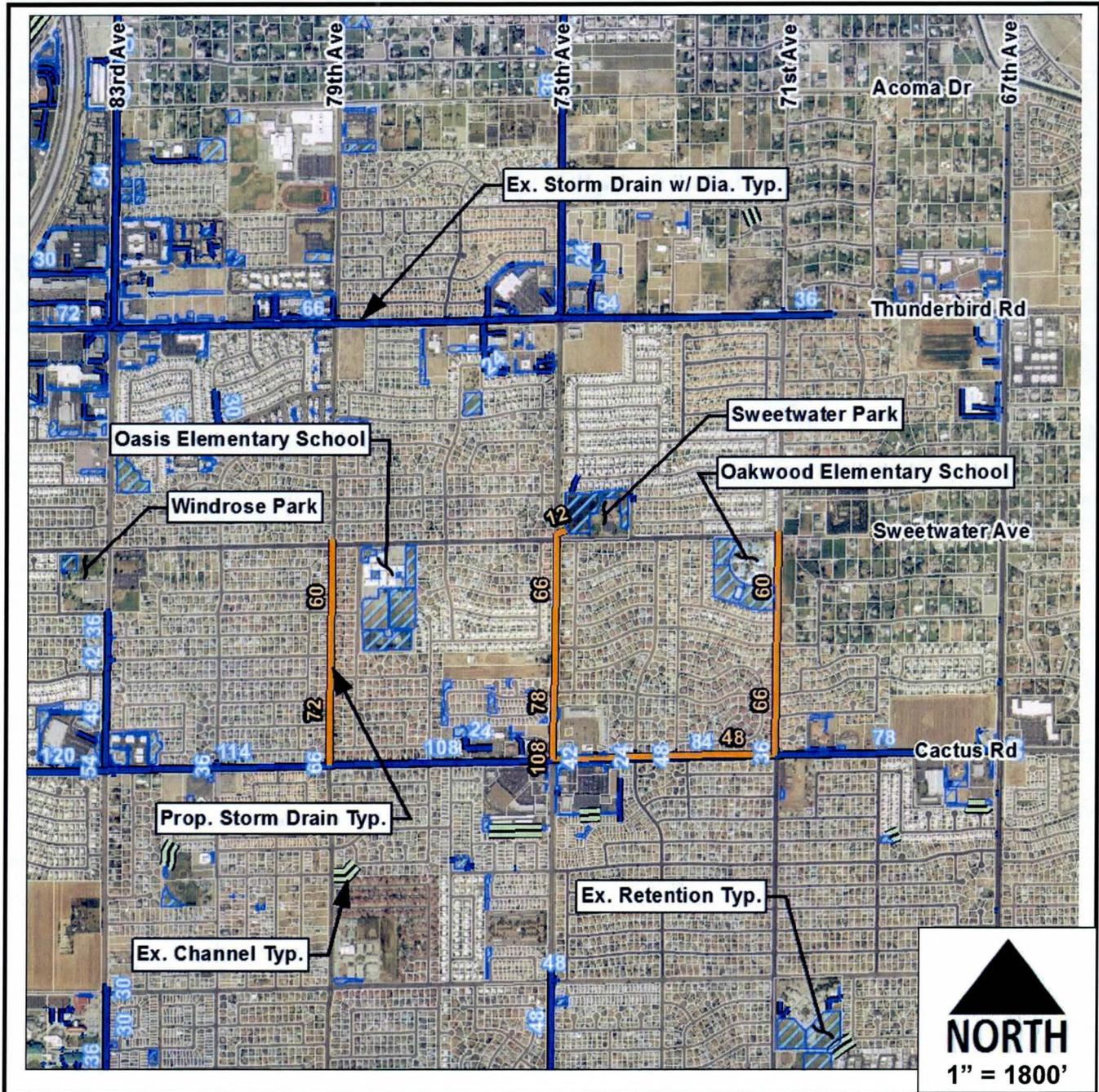
The analysis of Drainage Issues No. 8, 32, and 33 revealed that all issues are related to a lack of conveyance facilities on 71<sup>st</sup>, 75<sup>th</sup>, 79<sup>th</sup> Avenues and Cactus Road. The previous SDMP proposed storm drains along 71<sup>st</sup>, 75<sup>th</sup> and 79<sup>th</sup> Avenues that were not constructed. In addition, Drainage Issue No 5 is associated with an inadequate dewatering system of Sweetwater Park. The lack of regional conveyance facilities is compounded by several developments within the drainage area that were constructed without retention.

The preferred alternative includes storm drain pipes along 71<sup>st</sup>, 75<sup>th</sup> and 79<sup>th</sup> Avenues between Sweetwater Avenue and Cactus Road. Sweetwater Park will be connected via a 12-inch lateral pipe to the proposed storm drain at the intersection of 75<sup>th</sup> Avenue and Sweetwater Avenue. Also, a proposed storm drain parallel to the existing 84-inch diameter pipe will be constructed along Cactus Road between 71<sup>st</sup> and 75<sup>th</sup> Avenues. A variation to this alternative could be to add a new retention basin at the northwest corner of 67<sup>th</sup> Avenue and Cactus Road. This would eliminate the need for the proposed parallel storm drain along Cactus Road. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.7 – Drainage Issues No. 5, 8, 32, and 33 Preferred Alternative** below.

Figure 1.7 – Drainage Issues No. 5, 8, 32, and 33 Preferred Alternative

Drainage Area: 3

Drainage Issue ID: 5, 8, 32, 33



**Cost**

- Construction ..... \$ 5,405,000
- Right-of-Way ..... \$ 0
- Annual Maintenance ..... \$ 21,500

**Advantages**

- No right of way acquisition.
- Minimize impact to existing park facilities.
- Reduces flooding of the roadways.

**Disadvantages**

- Construction of large storm drains would require road closures, longer construction duration, and cause disruptions to adjoining neighborhoods.
- High construction cost.
- Requires constructing a new parallel storm drain on Cactus Rd.
- Additional maintenance cost for storm drains.

**Drainage Issue No. 9 – 83<sup>rd</sup> Avenue – Sweetwater Avenue to Corrine Drive**

Drainage Issue No. 9, located on 83<sup>rd</sup> Avenue from Sweetwater Avenue to Corrine Drive, has been a maintenance hot spot for the City of Peoria. Based on the analysis performed it is apparent that significant flows reach 83<sup>rd</sup> Avenue between Sweetwater Avenue and Corrine Drive and the existing drainage system is not adequate to handle the flows in a timely manner. Flow in this area is generated from three different sources: inflow from Sweetwater Avenue, runoff from the LDS church site, and flow from Corrine Drive.

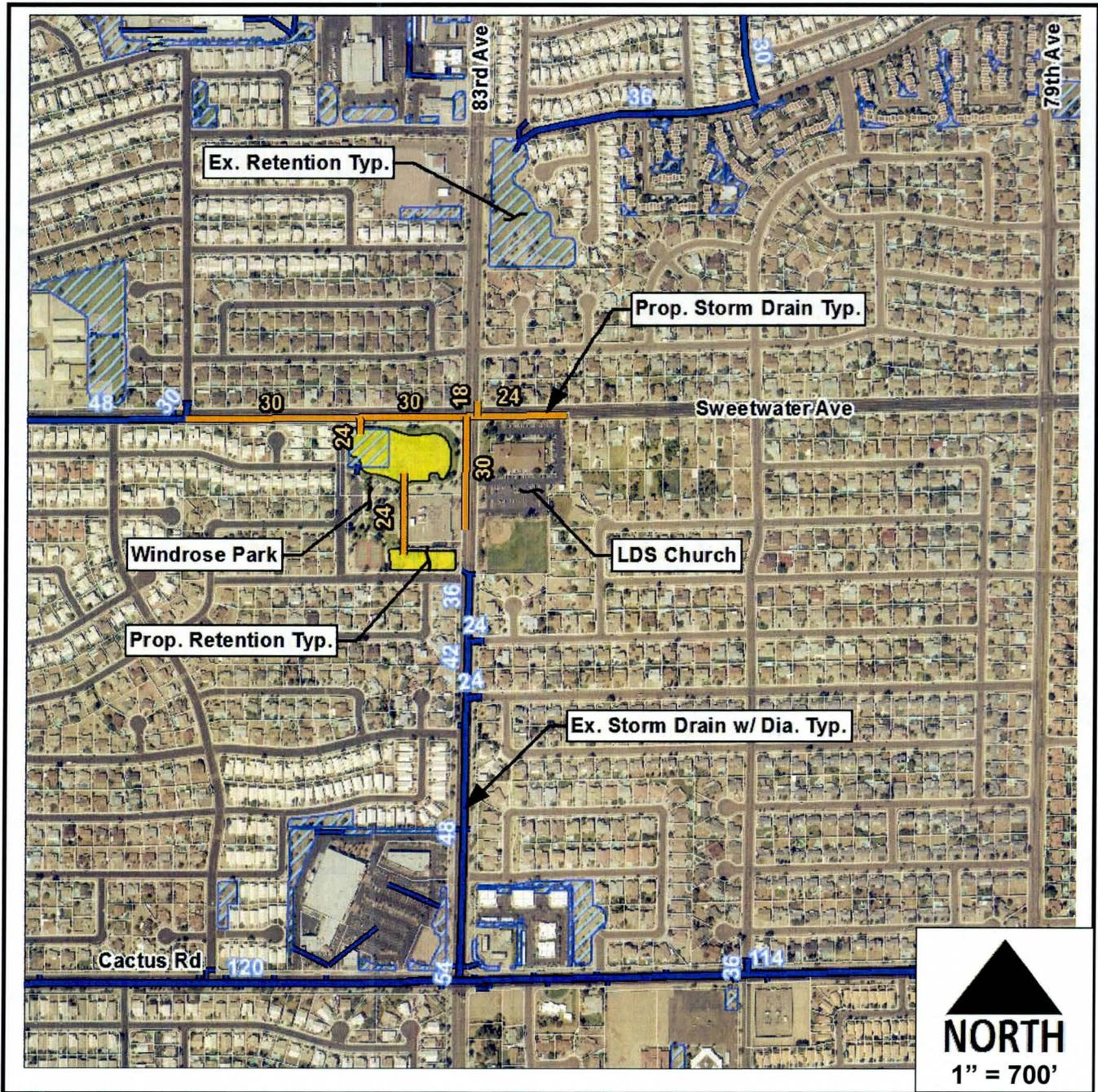
The preferred alternative consists of installing an 800 ft long storm drain along 83<sup>rd</sup> Avenue flowing north to Sweetwater Avenue and along Sweetwater Avenue connecting to the existing storm drains to the west (1300 ft). To prevent exceeding the capacity of the existing Sweetwater Avenue storm drain, the Windrose Park basin can be used as an offline basin to reduce peak flows in the storm drain.

This alternative will not affect the existing Sweetwater Avenue storm drain and may reduce the flows reaching the overtaxed Cactus Road storm drain. It also would provide a 10-year level of protection for a 1/4 of a mile of Sweetwater Avenue and alleviate the drainage and maintenance issues along 83<sup>rd</sup> Avenue between Corrine Drive and Sweetwater Avenue. It may also free up some of the capacity of the existing 83<sup>rd</sup> Avenue storm drain to better handle the flows reaching 83<sup>rd</sup> Avenue from the east. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.8 – Drainage Issue No. 9 Preferred Alternative** below.

Figure 1.8 – Drainage Issue No. 9 Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: 9 \_\_\_\_\_



**Cost**

• Construction.....	\$ 1,578,000
• Right-of-Way.....	\$ 0
• Annual Maintenance.....	\$ 15,400

- Advantages**
- Provide 10-year protection to 83<sup>rd</sup> Ave. (Sweetwater to Corrine).
  - Improvement to drainage conditions on 83<sup>rd</sup> Ave. south of Corrine.
  - Improvement to drainage along Sweetwater Ave in the vicinity of 83<sup>rd</sup> Ave.
  - Provides outfall to drain Windrose Park basin.
  - May reduce flows reaching the overloaded Cactus system.

- Disadvantages**
- Traffic disturbance on Sweetwater and 83<sup>rd</sup> Ave. during construction.
  - Disturbance and additional maintenance on Windrose Park.
  - Highest cost alternative.

### **Drainage Issue No. 10 – Roosevelt Street and 81<sup>st</sup> Avenue**

Several homes in the vicinity of 81<sup>st</sup> Avenue and Roosevelt Street flood regularly. These homes are slab on grade and even minor storms appear to cause flooding of the homes. Lack of retention on the upstream contributing area generates high flows throughout the contributing area and specifically in the vicinity of 81<sup>st</sup> Avenue and Roosevelt Street. As mentioned above, many of the homes in this area were built slab on grade and once the street capacity is exceeded flooding of the structures is almost certain. This is aggravated by the lack of capacity of the street section. Flat grades and roll curb result in very little roadway capacity and the potential for flooding is significant during even minor storm events. Fences and other obstructions within the properties in the problem area impede the movement of runoff through the private parcels and further contribute to the flooding by ponding the runoff on the properties.

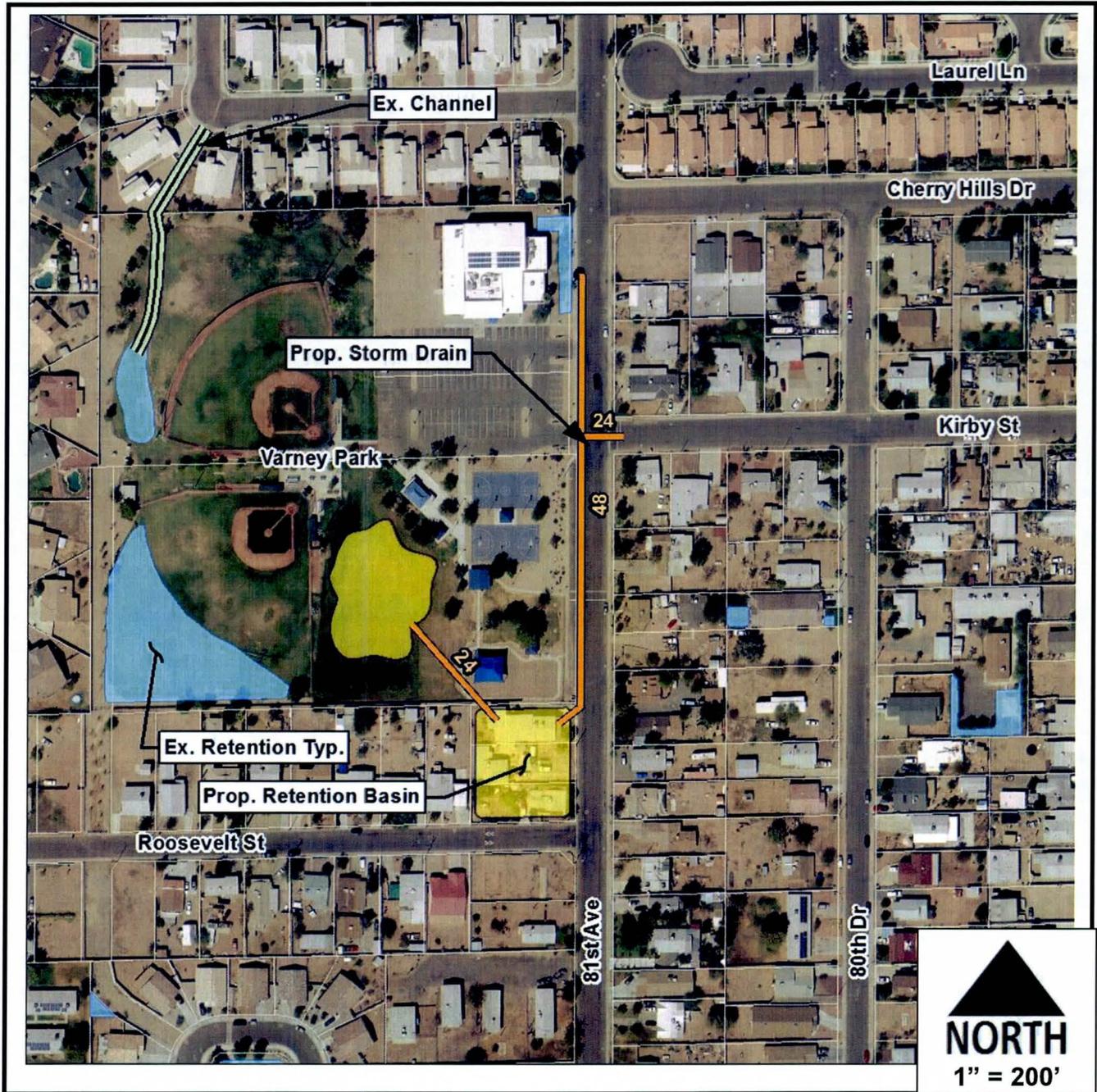
This alternative consists of purchasing the three high risk properties and constructing a retention basin and a storm drain along 81<sup>st</sup> Avenue to collect runoff from the street and convey it to the retention basin.

This alternative will eliminate the high risk properties and would provide 10-year protection along the alignment of the storm drain. Additionally it may provide some benefit to downstream properties. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.9 – Drainage Issue No. 10 Preferred Alternative** below.

Figure 1.9 – Drainage Issue No. 10 Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: 10 \_\_\_\_\_



**Cost**

Construction .....	\$ 554,000
Right-of-Way .....	\$ 90,000
Annual Maintenance .....	\$ 3,000

**Advantages**

- Eliminate flooding liability for the three properties identified at risk.
- Mitigate some of the lack of retention in the neighborhood.
- May provide some additional flood protection for properties along 81st Ave. Roosevelt Street.
- Basin can be incorporated with Varney Park.

**Disadvantages**

- Requires purchase of three homes.
- Traffic disturbance during construction.
- Low benefit/cost ratio.

**Drainage Issue No. 12 – Peoria Gardens Apartments at 85<sup>th</sup> Avenue and Grand Avenue**

The apartment complex at 10860 N. 85th Avenue (Peoria Gardens) has little or no retention and does not have an adequate drainage outlet. The City has requested that discharge facilities be sized as part of this study. The apartment complex drains towards a small depressed area at the southwest corner of the property. Besides this depressed area, and some other slightly depressed areas along the western property border, the apartments lack any retention facilities. Historically, overflow from the apartments would accumulate along the western property boundary and eventually spill to a previously undeveloped parcel to the west. When the parcel to the west was developed, improvements were made that appear to prevent the overflow from the apartments from spilling west into it. These conditions result in ponding on the apartment property. Additionally, runoff originating from a portion of the commercial property north of the apartments appears to drain into the apartment parking lot, which could exacerbate the issue.

The preferred alternative would increase the retention volume on the property to 100-year, 2-hour. A retention basin (0.75 acre-feet) and underground storage pipes (0.25 acre-feet) would be added on the west side of the property. Drywell(s) would also be constructed to drain the underground storage. In addition, a bleed off pipe would be constructed to connect the proposed retention basin to the existing 85<sup>th</sup> Avenue storm drain. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.10 – Drainage Issue No. 10 Preferred Alternative** below.

Figure 1.10 – Drainage Issue No. 12 Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: 12 \_\_\_\_\_



**Cost**

• Construction .....	\$284,000
• Right-of-Way .....	\$4,300
• Annual Maintenance .....	\$2,800

- Advantages**
- Promotes draining of basins.
  - Complies w/City requirement for storage of storm water.
  - Highest level of protection of all alternatives.

- Disadvantages**
- High construction and maintenance costs.
  - Most construction disruptions to apartments.

### **Drainage Issue No. 15 – Peoria Avenue and 98<sup>th</sup> Avenue**

Drainage Issue No. 15 is related to flooding on Peoria Avenue from 99<sup>th</sup> Avenue to the New River Bridge and along 98<sup>th</sup> Avenue just south of Peoria Avenue. Runoff generated along 99<sup>th</sup> Avenue, portions of Sun City South, and the Arrowhead Mall concentrates on Peoria Avenue. Due to the levee along New River, flow tends to pond on the road and the capacity of existing 18-inch storm drain is not adequate to drain the area resulting in flows moving south through the streets and parcels.

The preferred alternative proposed infrastructure is only for the reach of Peoria Avenue between just east of 99<sup>th</sup> Avenue and New River (incorporated City of Peoria). It utilizes the existing 36-inch culvert and the existing detention basin on the north side of Peoria Avenue. An option to this alternative would be to provide additional conveyance capacity by upsizing the proposed facilities along Peoria Avenue. In the future, this could create the opportunity to implement a regional solution for this area. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.11 – Drainage Issue No. 15 Preferred Alternative** below.

Figure 1.11 – Drainage Issue No. 15 Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: 15 \_\_\_\_\_



**Cost**

• Construction .....	\$ 200,000
• Right-of-Way .....	\$ 0
• Annual Maintenance .....	\$ 1,600

- Advantages**
- Provide 10-year level of protection along the alignment of the improvements.
  - No new connection through New River levee required.
  - Smaller infrastructure and less disturbance on Peoria Ave.
  - Maximize use of existing infrastructure.
  - May provide some protection south of Peoria Ave.
  - All improvements within the City of Peoria.
  - Low cost alternative.

- Disadvantages**
- Construction traffic disturbance
  - Does not provide any protection along 99<sup>th</sup> Ave

**Drainage Issue No. 30 – Grand Avenue Southwest of Intersection at 85<sup>th</sup> Avenue**

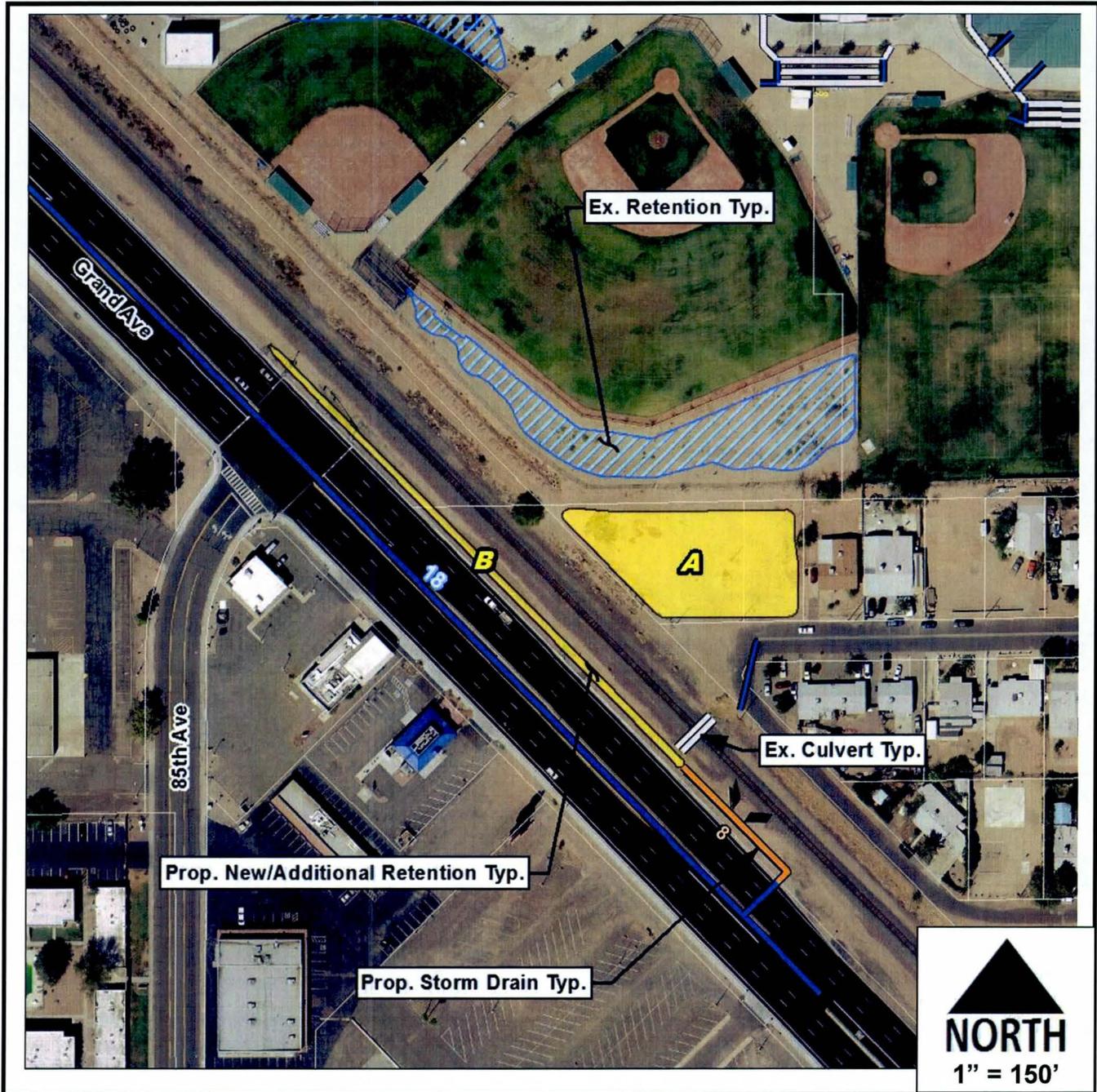
Drainage Issue No. 30 is related to ponding along the north side of Grand Avenue, just southeast of the intersection with 85<sup>th</sup> Ave, in an apparent sag area between the roadway and the railroad. This runoff originates from two 36-inch culverts that outflow into this area and curb openings along the north half of Grand Avenue, just southeast of the intersection with 85<sup>th</sup> Avenue. The 36-inch culverts drain an area on the north side of the tracks that has a Zone AH floodplain designation. Increasing runoff from the culverts and from the roadway could increase the ponding area and depth until the runoff flows over the curb and into the roadway.

The preferred alternative would construct a new retention basin in a vacant, undeveloped area near the culvert inlets on the north side of the tracks. The retention basin would be designed and sized to retain up to the 10-year runoff volumes. Flow through the culverts would be reduced and the corresponding ponding issue would be lessened. The alternative would also construct storage along Grand Avenue in the area between the railroad tracks and the roadway to collect roadway runoff. Furthermore, the ponding area would be drained via an 8-inch bleed-off pipe connected to an existing Grand Avenue catch basin located 160 ft southeast of the culverts crossing the railroad. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.12 – Drainage Issue No. 30 Preferred Alternative** below.

Figure 1.12 – Drainage Issue No. 30 Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: 30 \_\_\_\_\_



**Cost**

- Construction ..... \$ 344,000
- Right-of-Way ..... \$ 65,000
- Annual Maintenance ..... \$ 3,000

**Advantages**

- Provides flood protection for a 10-year event.
- May improve drainage for the development to the east.
- Reduce the potential for ponding on the north side of Grand Ave.
- Reduce flows on Grand Ave.

**Disadvantages**

- Require acquisition of property for the basin.
- Some construction disruption (noise, dust, etc) for neighborhood to the east.

**Drainage Issue No. 34 – Mountain View Road - 91<sup>st</sup> Avenue to 85<sup>th</sup> Avenue**

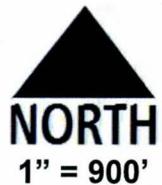
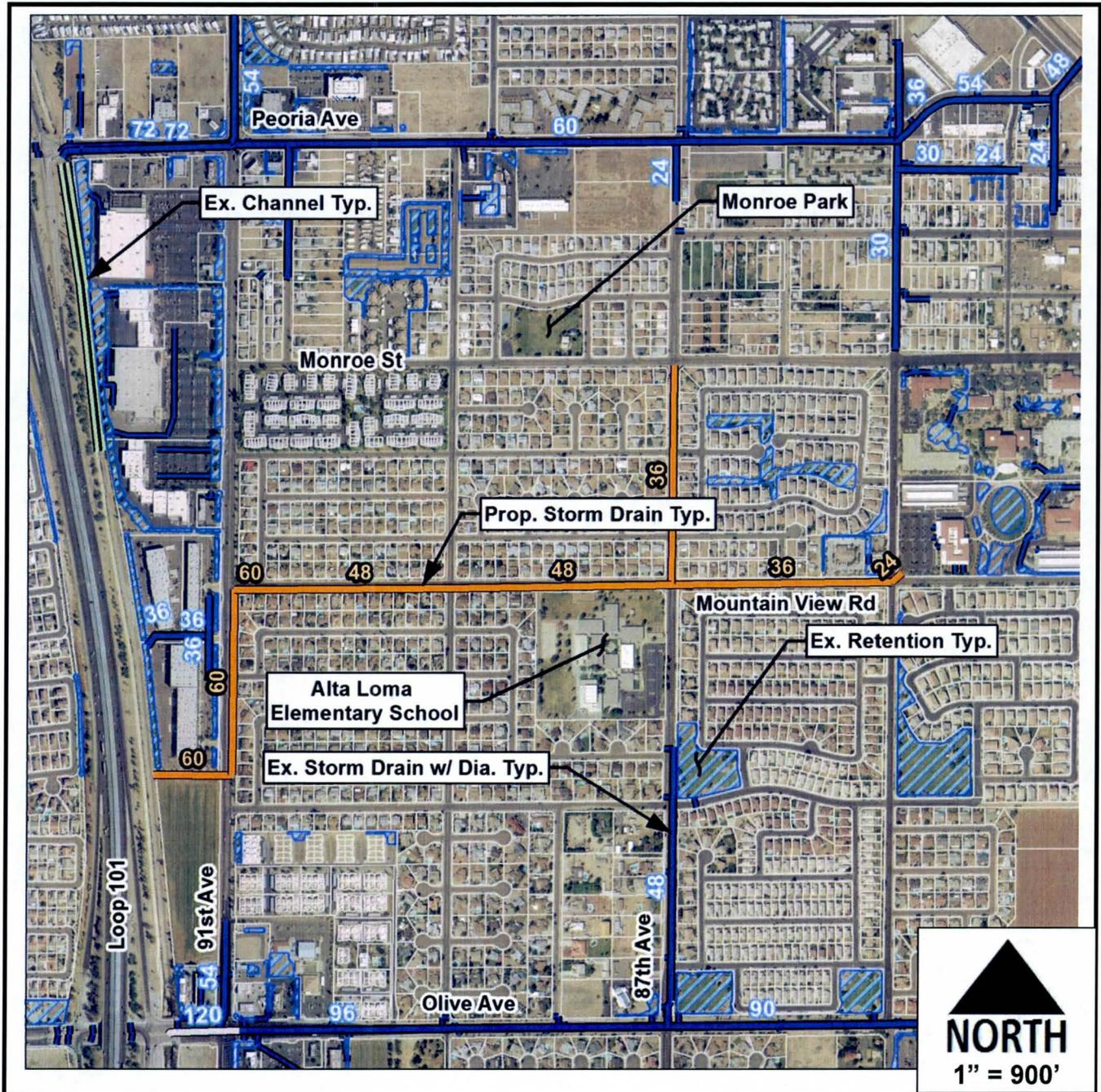
Drainage Issue No. 34 is related to street flooding along Mountain View Road from 89<sup>th</sup> Avenue to 91<sup>st</sup> Avenue. There is little retention in the area contributing to the above-mentioned location. This results in a large flow concentrating on the roadway. The longitudinal slope along Mountain View Road is very flat resulting in poor conveyance capacity and the accumulation of flows over time since flows cannot be quickly conveyed out of the area.

The preferred alternative consists of constructing a storm drain along Mountain View Road from approximately 85<sup>th</sup> Avenue to 91<sup>st</sup> Avenue, then continue south along 91<sup>st</sup> Avenue to the edge of the commercial development on the west side of 91<sup>st</sup> Avenue (1,100 ft) and a connection between the 91<sup>st</sup> Avenue storm drain to the ADOT channel along the Loop 101 Freeway (500 ft). In addition, this alternative includes a 36-inch storm drain pipe from Monroe Street to Mountain View Road and a 24-inch bleed-off pipe that connects the City Complex to the proposed storm drain at the intersection of Mountain View Road and 85<sup>th</sup> Avenue. The extension on Mountain View Road storm drain should be done in conjunction with connecting the 91<sup>st</sup> Avenue storm drain directly to the ADOT channel in order to provide hydraulic relief to the Olive Avenue storm drain. A variation of this alternative would be to go north along 91<sup>st</sup> Avenue and connect to the ADOT channel through the commercial properties 680 ft north of Mountain View Road. Since this alternative does not use the Olive Avenue storm drain system but creates a separate outfall, this solution may reduce the flows reaching the Olive Avenue storm drain system and improve conditions elsewhere in that system. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.13 – Drainage Issue No. 34 Preferred Alternative** below.

Figure 1.13 – Drainage Issue No. 34 Preferred Alternative

Drainage Area: 3

Drainage Issue ID: 34



**Cost**

• Construction .....	\$ 2,269,000
• Right-of-Way .....	\$ 8,500
• Annual Maintenance .....	\$ 14,000

**Advantages**

- Provides 10-year protection along storm drain alignment.
- May improve drainage conditions South of Mountain View Rd.
- Takes flows away from Olive Ave storm drain.
- Minimize traffic disturbances on 91st Avenue.

**Disadvantages**

- Construction traffic disturbance on 91<sup>st</sup> Ave and Mountain View Rd.
- Requires purchase of ROW for new outfall pipe.
- Requires new connection to ADOT's channel.
- Does not take advantage of existing 54-inch storm drain in 91<sup>st</sup> Ave.

#### 1.2.2.3 Problem Area 4

##### **Drainage Issue No. 16 – 69<sup>th</sup> Drive/Shangri La Road - Channel to Sundance Park**

Prior to the development of Sundance Elementary School and Sundance Park, the outfall from the Fairwood neighborhood located between Cholla Road and Shangri La Drive and between 69<sup>th</sup> Drive and 67<sup>th</sup> Avenue, was clogged and caused the ponding of runoff in the 69<sup>th</sup> Drive and Shangri La intersection and threatened homes. With development of Sundance Elementary School and Sundance Park, the channel outfall from the Fairwood neighborhood was improved.

Alternatives were not developed for this drainage issue because the outlet channel has adequate capacity to convey 100-year runoff originating from the subdivision.

##### **Drainage Issue No. 18 and 19 – 71<sup>st</sup> Avenue/73<sup>rd</sup> Avenue - Peoria Avenue to Mountain View Road**

Drainage Issue No. 18 is associated with storm water runoff from Peoria Avenue east of 71<sup>st</sup> Avenue and from 71<sup>st</sup> Avenue concentrating and overtopping the median curb along the south side of Peoria Avenue. Flows in the frontage road overtop the south curb and enter front yards. Wave action from vehicles causes some flooding. Storm water runoff flows to 73<sup>rd</sup> Avenue and then to Mountain View Road. A drainage outfall channel from the Leith Lane cul-de-sac collects sediment and debris, which backs up runoff and creates an odor and vector issue. The well site at 7021 West Peoria Avenue does not have a connection for discharge.

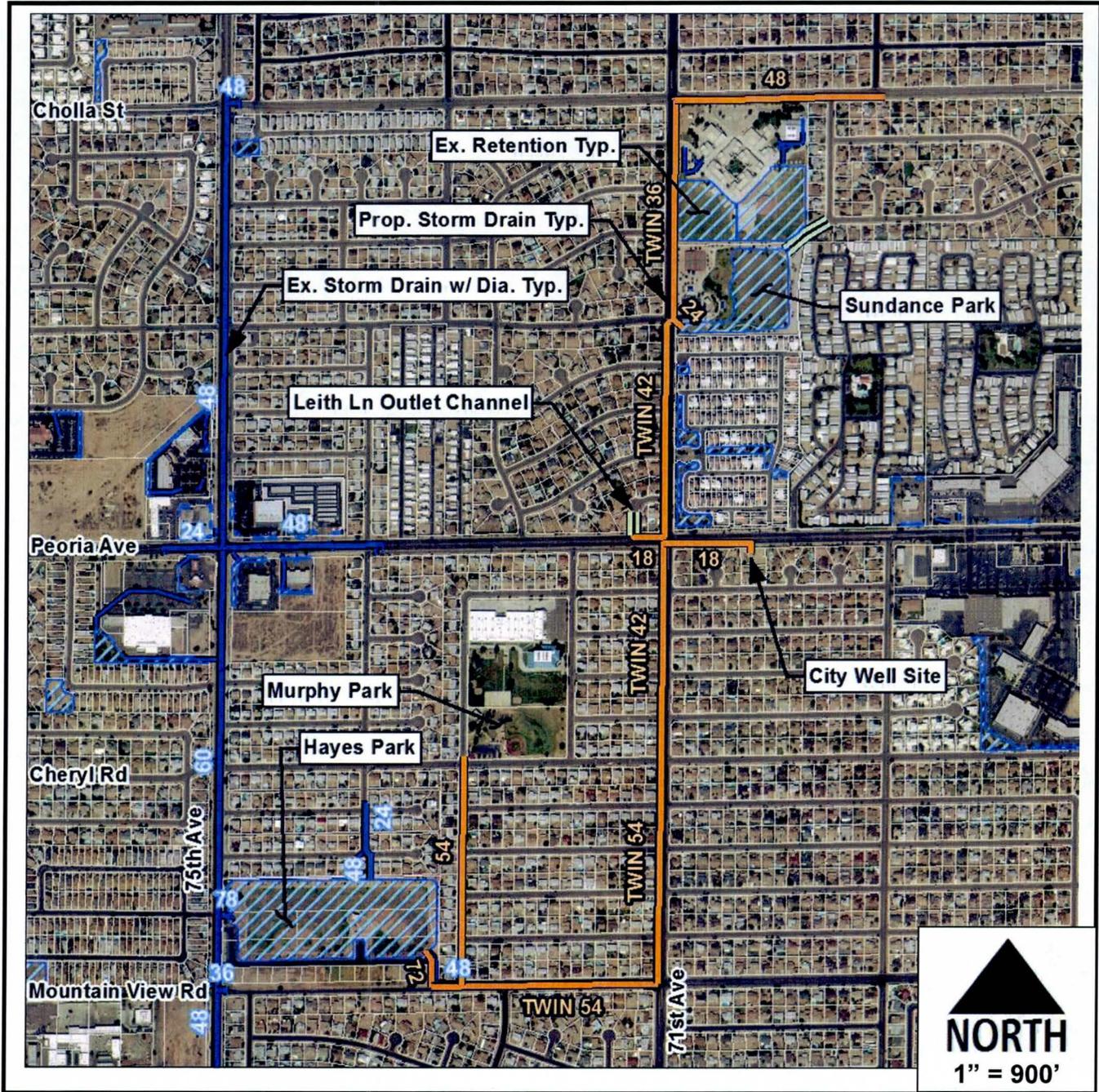
Drainage Issue No. 19 is related to runoff accumulating in 73<sup>rd</sup> Avenue from North Lane to Mountain View Road. This results in storm water ponding on 73<sup>rd</sup> Avenue at the intersection of Mountain View Drive.

The selected solution is mostly a conveyance alternative that includes a continuous storm drain on 71<sup>st</sup> Avenue between Cholla Street and Mountain View Road and on Mountain View Road between 71<sup>st</sup> Avenue and the Hayes Park retention basin. This alternative does not include adding any additional storage facilities except the consideration of potentially needing to increase the storage capacity of the Hayes Park retention basin. The proposed facility sizes for this alternative are shown on **Figure 1.14 – Drainage Issues No. 18 and 19 Preferred Alternative** below.

Figure 1.14 – Drainage Issues No. 18 and 19 Preferred Alternative

Drainage Area: 4

Drainage Issue ID: 18 & 19



**Cost**

- Construction ..... \$ 5,726,000
- Right-of-Way ..... \$ 0
- Annual Maintenance ..... \$ 16,500

**Advantages**

- No right of way acquisition.
- No impacts to existing park facilities.
- Minimizes construction on Peoria Ave.
- Eliminates flow heading south on 71st Ave from Mountain View Road.

**Disadvantages**

- May increase runoff volume to Hayes Park Basin, which may reduce the storm frequency at which the basin would overflow.
- Construction of large storm drains would require road closures and longer construction duration.

**Drainage Issue No. 25 – 103<sup>rd</sup> Avenue – Northern Avenue to Olive Avenue**

The Master Drainage plans calls for storm drains in the vicinity of 103<sup>rd</sup> Avenue draining into a storm drain along Northern Avenue and discharging into New River. In addition to the storm runoff, there is a groundwater well in this area that the City desires to connect to the storm drain. Also, a portion of the north part of the Country Meadows development does not have an adequate outfall and may need to be collected by the 103<sup>rd</sup> Avenue drainage system. The City is planning to improve 103<sup>rd</sup> Avenue from Olive to Northern Avenues and wants to know the size of improvements that should be constructed as part of these improvements.

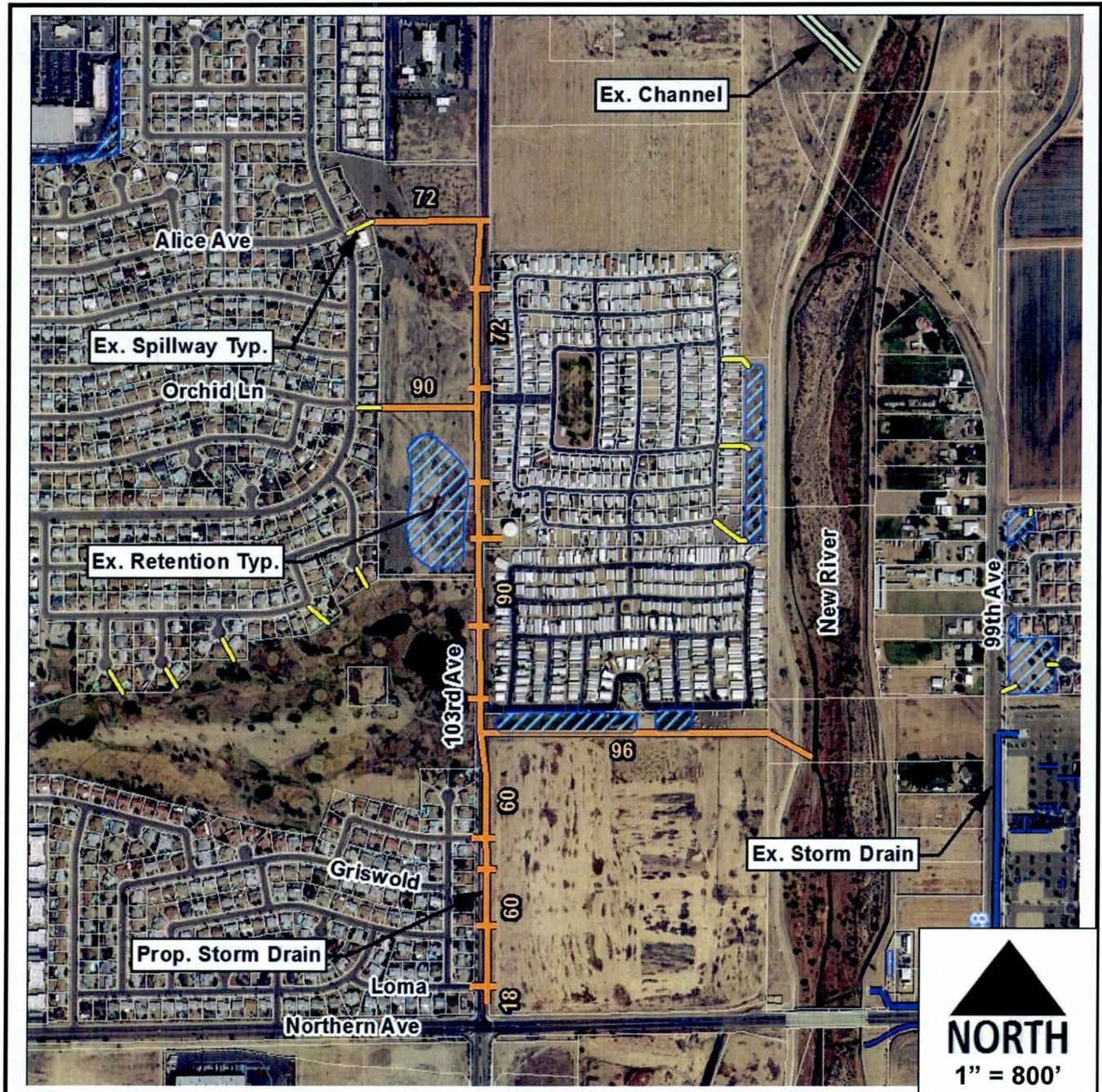
The preferred alternative consists of a single drainage system that conveys flows into the New River via a storm drain. This alternative will require the construction of a new culvert through the New River levee. Disturbance to the levee and discharge of unretained flows directly into the river may have some permitting and liability issues. However, a conveyance facility is more compatible with a power transmission line than a storage facility. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.15 – Drainage Issue No. 25 Preferred Alternative** below.

After the City's internal discussion regarding this drainage issue, it was decided that as part of this study, none of the proposed alternatives would be advanced in the design phase of this project. This drainage issue is being addressed under a City of Peoria 103<sup>rd</sup> Avenue Roadway Improvement project.

Figure 1.15 – Drainage Issue No. 25 Preferred Alternative

Drainage Area: 4 \_\_\_\_\_

Drainage Issue ID: 25 \_\_\_\_\_



**Cost**

• Construction .....	\$ 5,000,000
• Right-of-Way .....	\$ 27,000
• Annual Maintenance .....	\$ 18,000

**Advantages**

- More compatibility with Power Line Easement.
- No temporary infrastructure along Northern Ave. (Independent of improvement at Northern).

**Disadvantages**

- Requires new levee crossing structure and permits and potential liability associated with construction through levee.
- South portion of storm drain goes against grade.

**Drainage Issue No. 31 – 71<sup>st</sup> Avenue and Olive Avenue Intersection**

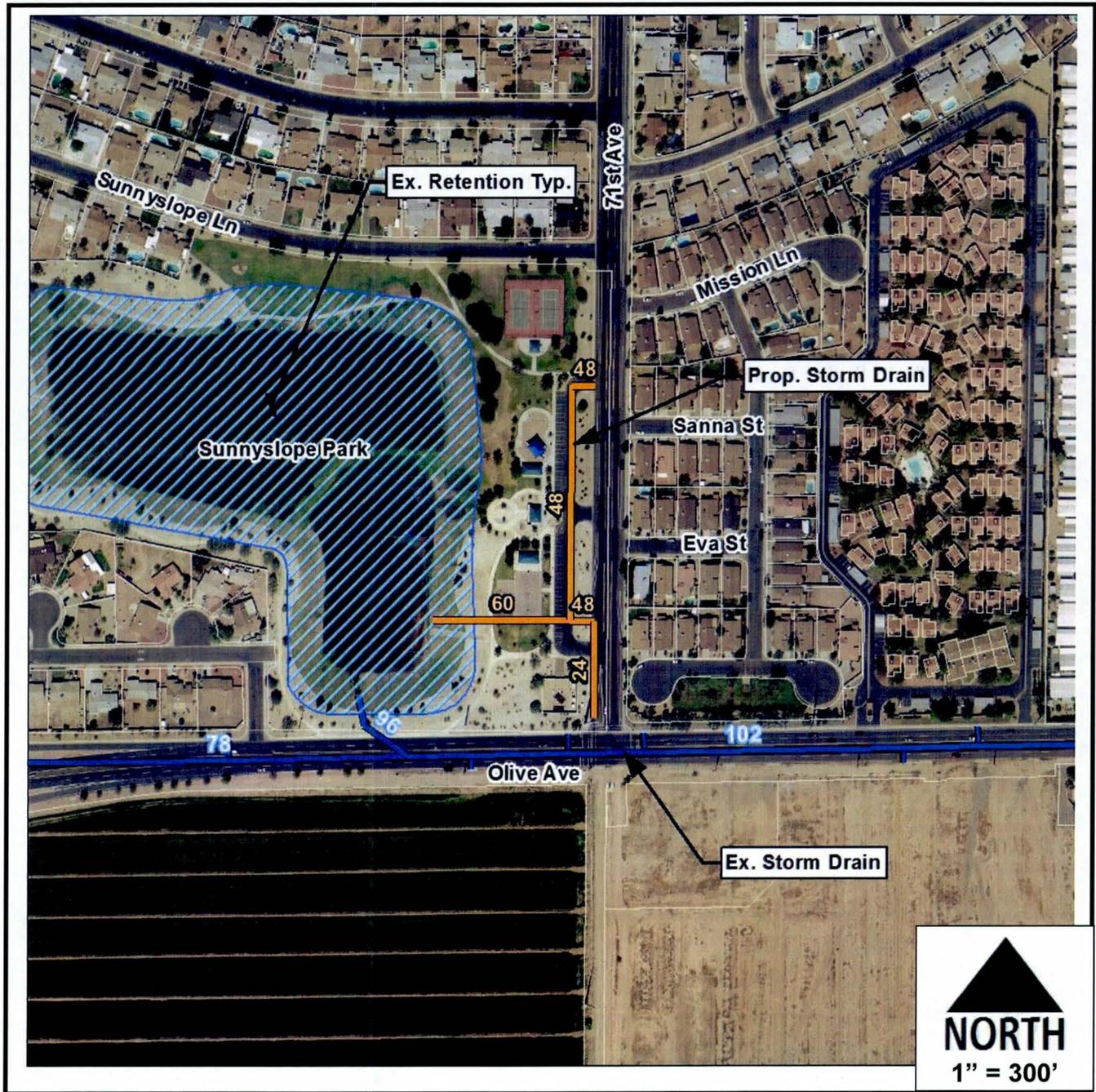
Flooding occurs at the intersection of Olive Avenue and 71<sup>st</sup> Avenue. Flooding extends north along 71<sup>st</sup> Avenue and inundates the Sunnyslope Park parking lot. Surface flows enter the Sunnyslope regional retention basin and cause erosion of the side slopes of the basin. The City has bermed the perimeter of the basin and concentrated the flows at locations where erosion protection was installed.

The preferred alternative consists of constructing a storm drain through the Sunnyslope Park parking lot and extending into 71<sup>st</sup> Avenue to drain the roadway more efficiently and intercept the flows in 71<sup>st</sup> Avenue before they reach the Olive Avenue intersection. This storm drain will discharge directly into the Sunnyslope Park regional retention basin. Alternately, this storm drain could be connected to the Olive Avenue storm drain to maximize the effectiveness of the regional basin and reduce nuisance flows in the basin. This alternative should alleviate potential sheet flow through the park facilities on the east side of the basin. Proposed drainage facilities, costs, advantages, and disadvantages for the preferred alternative are shown on **Figure 1.16 – Drainage Issue No. 31 Preferred Alternative** below.

Figure 1.16 – Drainage Issue No. 31 Preferred Alternative

Drainage Area: 4 \_\_\_\_\_

Drainage Issue ID: 31 \_\_\_\_\_



**Cost**

• Construction .....	\$ 385,000
• Right-of-Way .....	\$ 0
• Annual Maintenance .....	\$ 1,760

- Advantages**
- Limited disruption of traffic on Olive Avenue during construction.
  - Limited utility conflicts.

- Disadvantages**
- Direct nuisance flows directly into the basin (wet conditions more often).
  - On line condition may reduce capacity for offline flows.
  - Disruption of parking lot during construction.

### 1.3 ADDITIONAL MASTER PLANNED FACILITIES

A significant portion of the previous Master Plan has been constructed; however, there are several locations where infrastructure had previously been proposed but has not yet been built. An analysis was performed to determine if the remaining proposed infrastructure was still needed and could be integrated into the existing drainage system. Based on the hydrologic/hydraulic analysis, drainage facilities identified under the previous Master Plan were required for three problem areas. These drainage facilities are described in the following subsections.

#### 1.3.1.1 Cholla Street & 83<sup>rd</sup> Avenue to Peoria Avenue

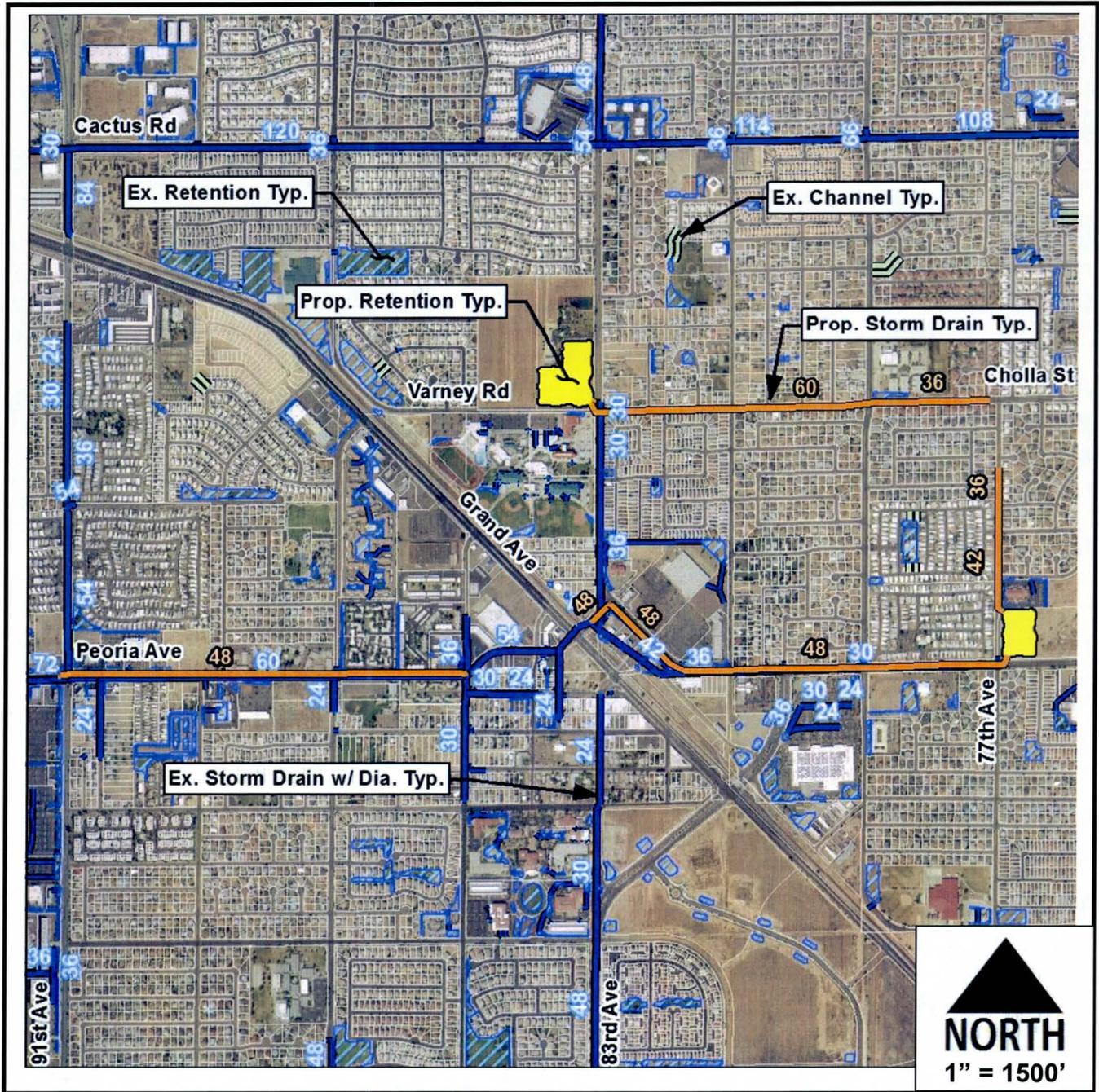
Alternatives were developed to address the lack of adequate conveyance facilities on 83<sup>rd</sup> Avenue between Varney Road and Grand Avenue and on Peoria Avenue between 77<sup>th</sup> Avenue and 91<sup>st</sup> Avenue. In general, the alternatives considered conveyance facilities sized to carry the 10-year flows that could not be carried by the existing facilities. Furthermore, the alternatives considered adding new retention basins to reduce the need for and / or size of the proposed storm drains.

The preferred alternative consists of the construction of storm drains along Cholla Street, Peoria Avenue and 77<sup>th</sup> Avenue. In addition, new retention basins are proposed on the northeast corner of Varney Road and 83<sup>rd</sup> Avenue, and on the northeast corner of 77<sup>th</sup> Avenue and Peoria Avenue. These would provide a total of 24 ac-ft of retention volume and will reduce the proposed storm drain sizes along Peoria Avenue and entirely eliminate the need for parallel storm drain pipes along 83<sup>rd</sup> Avenue and across Grand Avenue. The corresponding proposed facility sizes for the preferred alternative are shown in **Figure 1.17 – 83rd Avenue to Peoria Avenue Preferred Alternative** below.

Figure 1.17 - 83<sup>rd</sup> Ave to Peoria Ave Preferred Alternative

Drainage Area: 3 \_\_\_\_\_

Drainage Issue ID: Peoria and 83rd Ave \_\_\_\_\_



**Cost**

• Construction.....	\$ 6,808,000
• Right-of-Way.....	\$ 876,000
• Annual Maintenance.....	\$ 120,000

**Advantages**

- No construction disturbance on 83<sup>rd</sup> Ave
- Minimizes required storm drain sizes

**Disadvantages**

- Requires significant right of way acquisition
- Increased maintenance costs associated with additional basins and storm drains
- Highest construction costs

### 1.3.1.1 87<sup>th</sup> Avenue – ID108 in Network 3012

A planned 42-inch storm drain with the design capacity of 42 cfs was proposed along 87<sup>th</sup> Avenue from approximately Sahuaro Drive to Peoria Avenue. The previous Master Plan proposed a 42-inch storm drain connecting to the existing storm drain at the intersection of Peoria Avenue and 87<sup>th</sup> Avenue.

An analysis was performed to determine if a storm drain would need to be proposed along 87<sup>th</sup> Avenue from Grand Avenue to Peoria Avenue. The analysis showed that the contributing flows exceed the street capacity along 87<sup>th</sup> Avenue from Mescal Street to Peoria Avenue. Therefore, a 36-inch storm drain would need to be proposed along 87<sup>th</sup> Avenue from Mescal Street to Peoria Avenue. See **Figure 1.18 – Network 3010 and 3012 Proposed Facilities** for details.

### 1.3.1.2 Grand Avenue – ID134 & ID135 in Network 3010

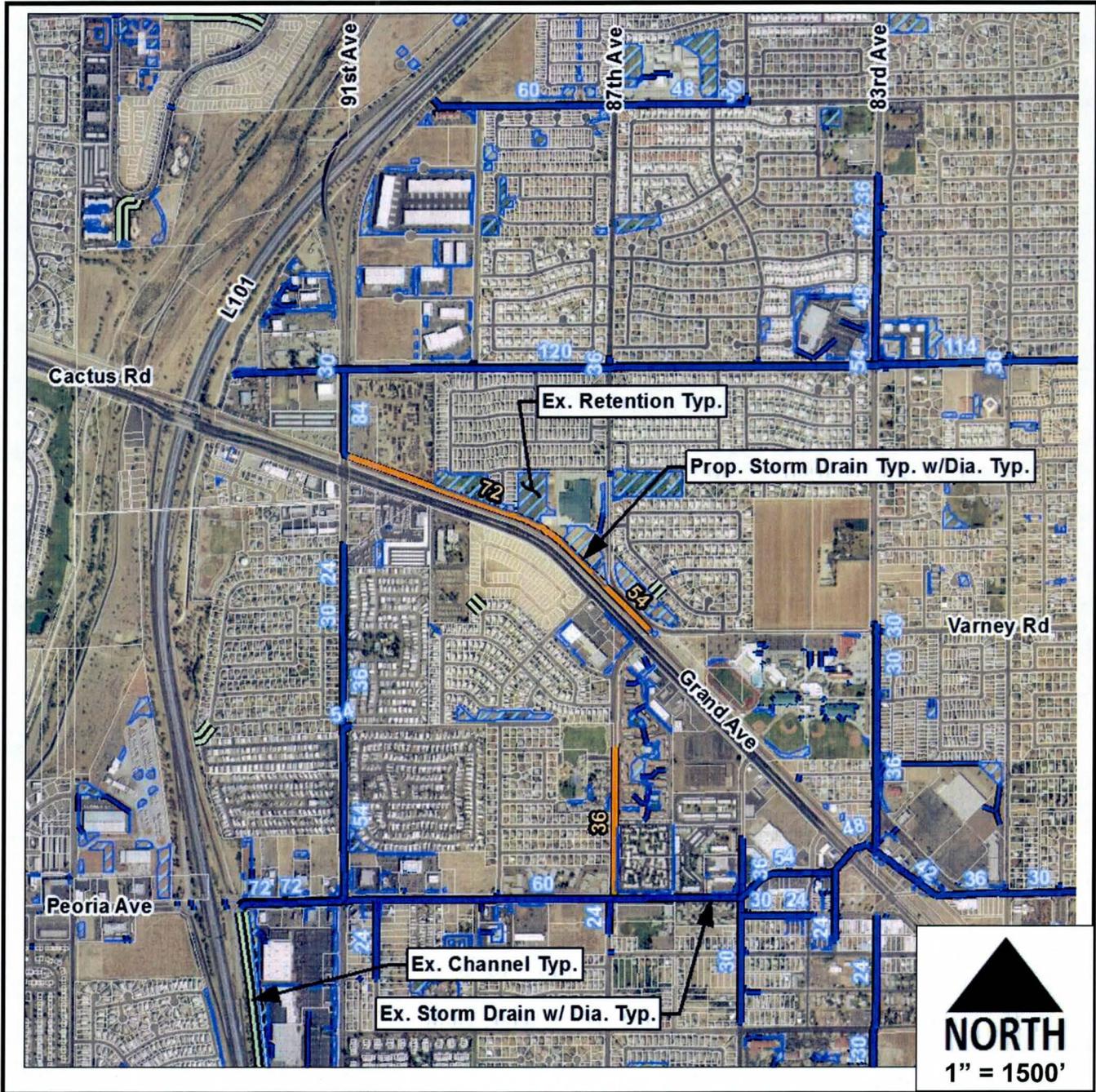
A planned 84-inch storm drain with the design capacity of 230 cfs was proposed along Grand Avenue from approximately 87<sup>th</sup> Avenue to 91<sup>st</sup> Avenue. The previous Master Plan proposed an 84-inch storm drain connecting to the existing storm drain at the intersection of Grand Avenue and 91<sup>st</sup> Avenue. Currently, there is an existing 84-inch pipe along 91<sup>st</sup> Avenue from Grand Avenue to Cactus Road. In addition, there is a depressed area along the north side of Grand Avenue that forms a small swale. However, there is no guarantee that this swale would be there in the future therefore it was not considered in this analysis.

An analysis was performed to determine if a storm drain would need to be proposed along Grand Avenue from Varney Road to 91<sup>st</sup> Avenue. The analyses showed that a 54-inch storm drain would need to be proposed along Grand Avenue from Varney Road to 87<sup>th</sup> Avenue and a 72-inch storm drain from 87<sup>th</sup> Avenue to 91<sup>st</sup> Avenue. See **Figure 1.18 – Network 3010 and 3012 Proposed Facilities** for details.

Figure 1.18 – Network 3010 and 3012 Proposed Facilities

Drainage Issue ID: Grand Ave – ID134 & ID135 in Network 3010

Drainage Issue ID: 87<sup>th</sup> Ave – ID108 in Network 3012



**Cost**

**Grand Ave - Network 3010**

• Construction .....	\$ 2,051,000
• Right-of-Way .....	\$ 0
• Annual Maintenance .....	\$ 7,500

**Cost**

**87<sup>th</sup> Ave - Network 3012**

• Construction .....	\$ 380,000
• Right-of-Way .....	\$ 0
• Annual Maintenance .....	\$ 3,000

## 1.4 CONCLUSIONS

The main goal of Peoria SDMP was to identify drainage issues throughout project area and develop alternatives to mitigate these issues. As a result, twenty different flood prone areas that required drainage improvements were analyzed as part of this project. For each flood prone area, several alternatives were developed and evaluated to select the most feasible solution. The selected alternatives were refined further and conceptual design plans were prepared for each one. The conceptual design plans were prepared at 15 percent design level and include the proposed facilities sizes, slopes, horizontal and vertical alignment, major utilities and other key features for specific solutions. In addition, a prioritization plan was developed to facilitate the drainage improvements implementation and their placement into the City of Peoria Capital Improvement Plan.

### 1.4.1 Agency Information

City of Peoria  
8401 West Munroe Street  
Peoria, AZ 85345  
(623) 773-7000

For Information Contact: Burton Charron

Flood Control District of Maricopa County  
2801 West Durango Street  
Phoenix, AZ 85009  
(602) 506-1501

For Information Contact: Valerie Swick