

Metro Phoenix Area Drainage Master Plan

Flood Control District of Maricopa County

In association with

City of Phoenix

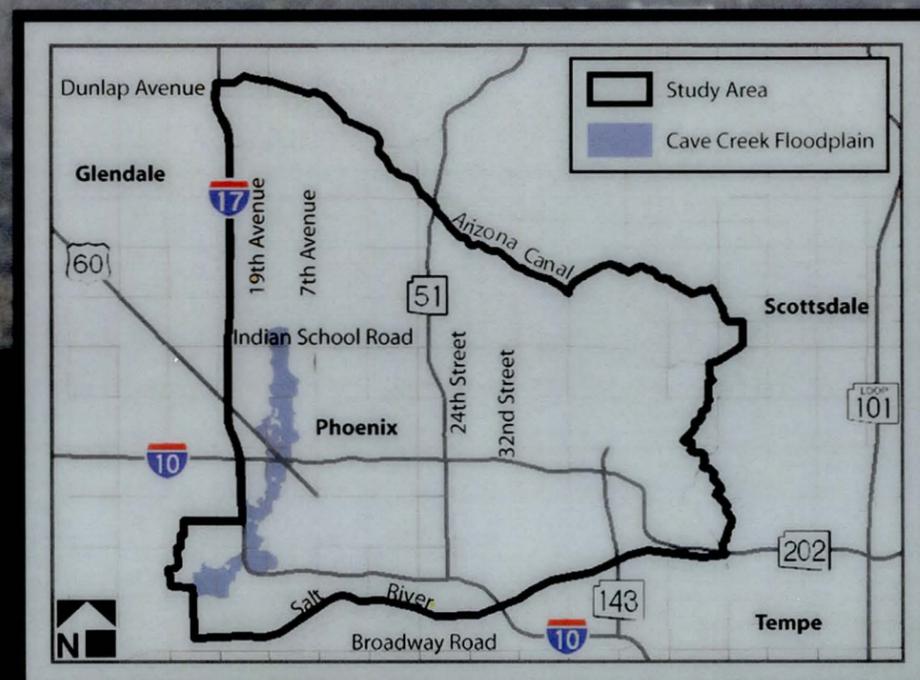


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and Logan Simpson Design Inc.*



September 2008

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA



METRO PHOENIX AREA DRAINAGE MASTER PLAN
RECOMMENDED PLAN
FCD 2004C040

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**Reports Under Separate Cover
(Prepared as part of the Metro Phoenix ADMP)**

1. *Metro Phoenix ADMP Data Collection Report*. EEC. October 2006.
2. *Hydrologic Study Report for Metro Phoenix Area Drainage Master Study/Plan*. Wood/Patel and Assoc. October 2006
3. *Metro Phoenix ADMP: Potential Alternatives Report: Level I Analysis*. EEC. March 2007.
4. *Metro Phoenix ADMP Level II Report*. EEC. January 2008.
5. *Cave Creek Floodplain Re-Delineation Study*. EEC. July 2007.
6. *Scenery & Recreation Resource Assessment*. Gavan & Barker. January 11, 2008.
7. *Metro Phoenix Area Drainage Master Plan 2005- 2008 Public Meetings: Public Involvement Summary*. LSD. September 2008
8. *Recommended Alternatives Analysis Environmental Considerations*. Logan Simpson Design. April 2007

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of the Metro Phoenix Area Drainage Master Plan (ADMP) is to identify and quantify flood hazards within the study boundaries and to develop a recommended plan for mitigation of these problems in ways that are context sensitive with the landscape settings of the study area and protect and enhance the beneficial functions served by flood plains. The Flood Control District of Maricopa County (District) in association with City of Phoenix (City) initiated the Metro Phoenix ADMP to address the drainage issues within the urbanized areas of the City as well as the re-delineation of the effective Cave Creek Floodplain within the Metro Phoenix ADMP study area.

1.2 Project Participation

The City Transportation Department was a major stakeholder on this project. Additional stakeholders included the Arizona Department of Transportation (ADOT), the Salt River Project (SRP) and other City agencies such as the Parks and Recreation Department.

1.3 Study Area and History

The study area for the Metro Phoenix ADMP is shown in Figure 1. The area is bounded by the Arizona Canal Diversion Channel (ACDC) on the north, Interstate 17 (I-17) on the west, the Salt River on the south, and the ridgeline in the Papago Buttes on the east. Between 44th Street and 60th Street, the study area extends north of the Arizona Canal up to the ridgeline of Camelback Mountain. The total study area is approximately 90 square miles. The study also includes a portion of the Durango ADMP study area, west of I-17, which encompasses the Cave Creek Floodplain and its corresponding watershed (blue shaded area on Figure 1). The reason for including the Durango area in the Metro Phoenix ADMP is for the re-study of the Cave Creek Floodplain; no new flood mitigation plans will be developed for the Durango watershed, as this effort was previously accomplished as part of the Durango ADMP.

The study area is entirely developed making it unique from other ADMPs. There is no undeveloped open space to provide storm water

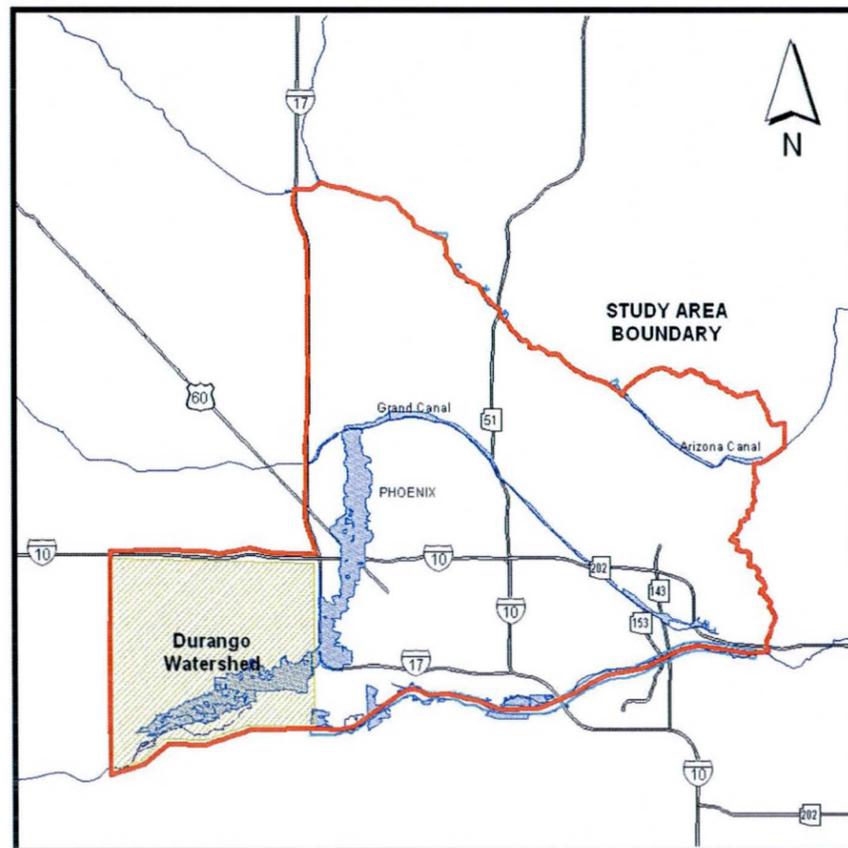


Figure 1 - Study Area Map

retention or create 100-year drainage infrastructure. Moreover, large portions of the study area were developed before the City’s drainage ordinance was enacted. Consequently, many of these older developments have drainage problems; the most common problem being finished floor elevations that are too low relative to the adjacent street grade.

1.4 Purpose of this Report

The purpose of this report is to document and summarize the recommended plan for drainage solutions in the Metro Phoenix area. This report contains preliminary information, conceptual designs as well as the recommended plan. The report also describes the process used to reach the recommended plan.

2.0 RE-DELINEATION OF THE CAVE CREEK FLOODPLAIN

Cella Barr Associates prepared the report entitled “Cave Creek Wash Flood Insurance Re-Study, Maricopa County, Arizona (1989)” and delineated the effective floodplain for Cave Creek from the Grand Canal to the confluence with the Salt River. Cella Barr’s re-study of the floodplain accounted for the mitigating effects of the ACDC. The re-study included development of a new hydrologic model for the existing conditions 100-year flood flows. The floodplain delineation is shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panels: Community 04013C – panels 1665, and 2130.



19th Avenue and McDowell Road – July 26, 2007

Since the Cella Barr study, the City has processed two Letters of Map Revisions (LOMR’s) that resulted in the elimination of the effective floodplain upstream of the Grand Canal. Downstream of the Grand Canal, however, the floodplain remained unchanged from the 1991 study.

The Metro ADMP study originally intended to re-delineate the entire Cave Creek Floodplain from the Grand Canal all the way to the confluence with the Salt River. During the course of the study, however, it was decided to break this re-delineation into several phases.

As part of this study, the first phase of floodplain re-delineation has been prepared for the Cave Creek Floodplain from the Grand Canal to the Interstate 10 (I-10). The reach length is approximately 2.6 miles. The basis of the re-delineation is new hydrologic data for the area based upon better mapping and improved hydraulic methodology. The floodplain re-delineation was based on the peak discharges from the existing conditions hydrology models created from the Metro Phoenix ADMP study. The 100-year, 24-hour which is

the higher peak between the 100-year, 6-hour and 100-year, 24-hour models was used for the floodplain delineation.

This is an urban area without a defined low-flow channel so the runoff is shallow sheet flow across a wide area. By FEMA definition, if the average depth of flow is less than one-foot (0.94 feet or less) across a cross section of the floodplain, then the area is not considered to be within a floodplain. This definition was used to request the previous LOMRs prepared for the Cave Creek Floodplain between the Grand Canal and the ACDC. The same methodology was used and cross sections with an average depth less than one-foot (rounded to the nearest tenth) were considered to be out of the effective floodplain as shown on Figure 2. A HEC-RAS model was developed to document the flow and water surface elevations used in this determination.

The LOMR was submitted to FEMA in July, 2007 and approved by FEMA on December 14, 2007. The effective date on the updated FIRM panels is January 14, 2008.

During all public meetings, the project team advised that, even though the floodplain designation was removed, there are still homes susceptible to flooding; particularly the low lying homes. The homeowners were strongly encouraged to maintain flood insurance which they will be able to get at a reduced rate.

3.0 PRELIMINARY ALTERNATIVES ANALYSIS (Level I)

3.1 Data Collection

The initial data collection effort included obtaining all recorded drainage complaints from the City. These complaints were mapped and categorized by flooding type and severity and each was evaluated to determine if the flooding was the result of a local problem or whether it was more regional in nature. Additional data collection included gathering and reviewing existing drainage reports and as-built plans, and preparing an inventory of existing and planned drainage infrastructure within the Metro Phoenix ADMP study area. Data pertaining to environmental, cultural, scenery, open space and recreation resources were also collected to help define the land and resource context of the study area.

3.2 Public Input

There was a series of public meetings held during the Level I analysis. These first meetings were held in July 2005. As part of these meetings, the study team informed the public of the re-delineation of the Cave Creek Floodplain and collected additional drainage complaints from the citizens. There were three meetings held in July, 2005. The public meetings are documented in a report under a separate cover entitled, "Metro Phoenix ADMP 2005-2008 Public Meetings, Public Involvement Summary," dated September, 2008.

3.3 Technical Analysis

Technical analysis included preparation of multi-frequency hydrologic models for the overall watershed having subbasins with drainage areas of about a half square mile each. This was the most important technical analysis performed during the Level I analysis. The alternatives developed to solve the flooding issues were sized based on the results of this modeling. Documentation of the analysis and results of the existing conditions hydrologic modeling can be found in a report under a separate cover entitled "Hydrologic Study Report for Metro Phoenix Area Drainage Master Study/Plan," dated October, 2006.

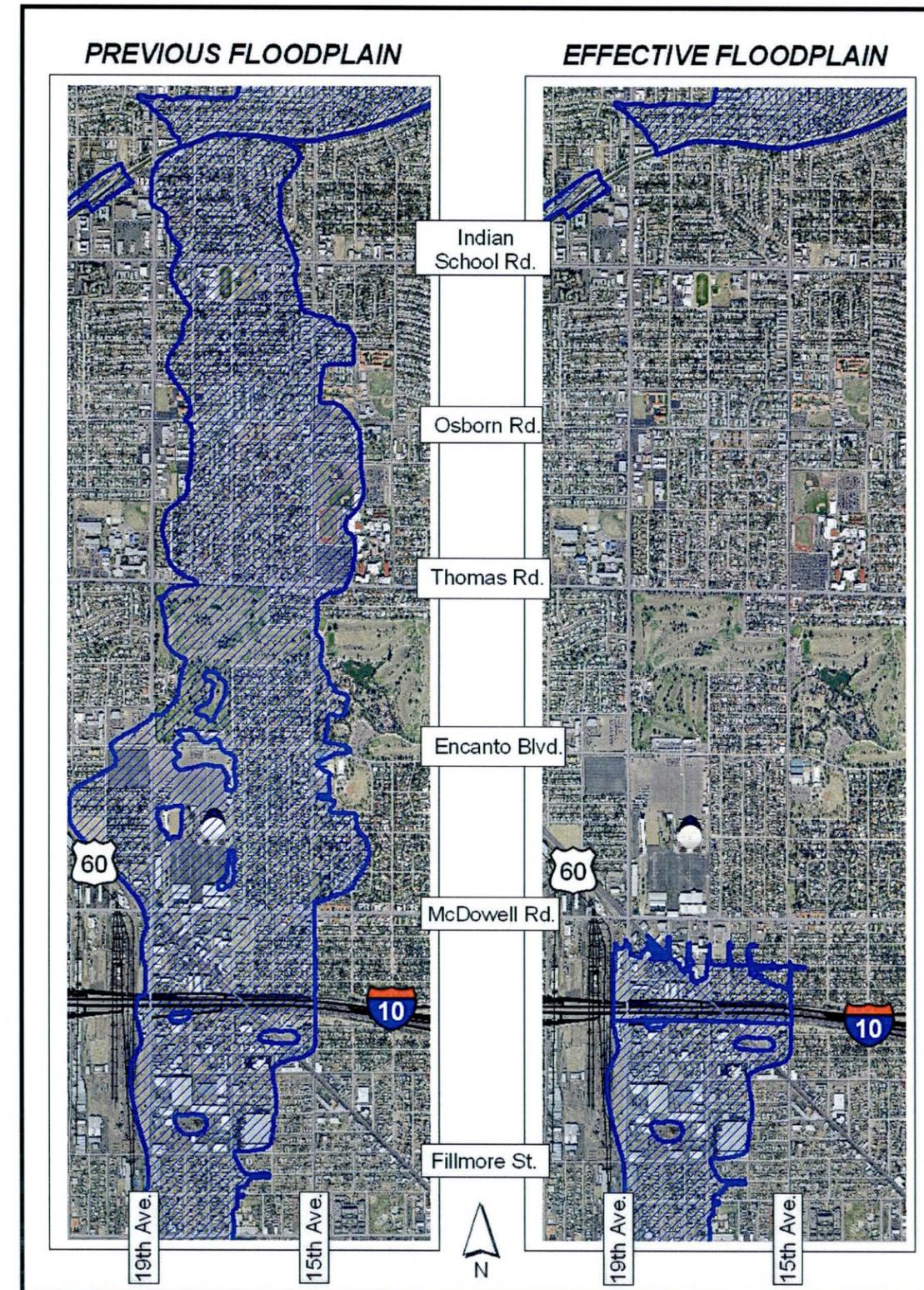


Figure 2 - Re-delineation of the Cave Creek Floodplain

In addition to the hydrologic modeling, the project team met with stakeholders to brainstorm potential solutions to the flooding problems. The project team took the best solutions and moved forward with them while collecting information on flooding complaints, environmental and cultural issues, and scenery/visual character. The study team reviewed as-builts for existing storm drains to ensure that outlets for the potential detention basins and storm drains were available. Cost estimates were developed based on per linear foot costs of pipe for new storm drains and lump sum for other elements of the potential alternatives. A 20% contingency was added to the total project cost for each potential alternative. Detailed information for the Level 1 effort can be found in a report under a separate cover entitled "Metro Phoenix ADMP Potential Alternatives Report: Level I Analysis," dated March, 2007.

3.4 Floodprone Areas

Based on the data collection and public input, eight flood prone areas were identified in the preliminary alternative analysis phase of the Metro Phoenix ADMP as identified below:

Cave Creek Floodplain: As evidenced by numerous drainage complaints, the low-lying areas within the old Cave Creek Floodplain are still susceptible to flooding. This area is approximately 10 square miles in size, located between the ACDC to the north, the Grand Canal to the south, I-17 to the west, and 7th Street to the east. Prior to construction of the ACDC, flood flows from Cave Creek would inundate this area, hence the name Cave Creek Floodplain. But even though the ACDC captures and diverts the upstream flows, eliminating the floodplain designation, the area still experiences flooding problems. These problems are primarily due to the topographic shape of the area, which is a very wide and shallow conveyance corridor lacking a defined low-flow channel. The rest of the Metro Phoenix ADMP study area is more characteristic of a sloping plain where runoff that exceeds the conveyance capacity of the streets, flows overland as shallow sheet flow. In contrast, the topography of the Cave Creek Floodplain tends to concentrate runoff. Consequently, during times of heavy rainfall, runoff can exceed the capacity of the 2-year storm drain system and accumulate, causing flood damage to those properties located in low-lying areas.

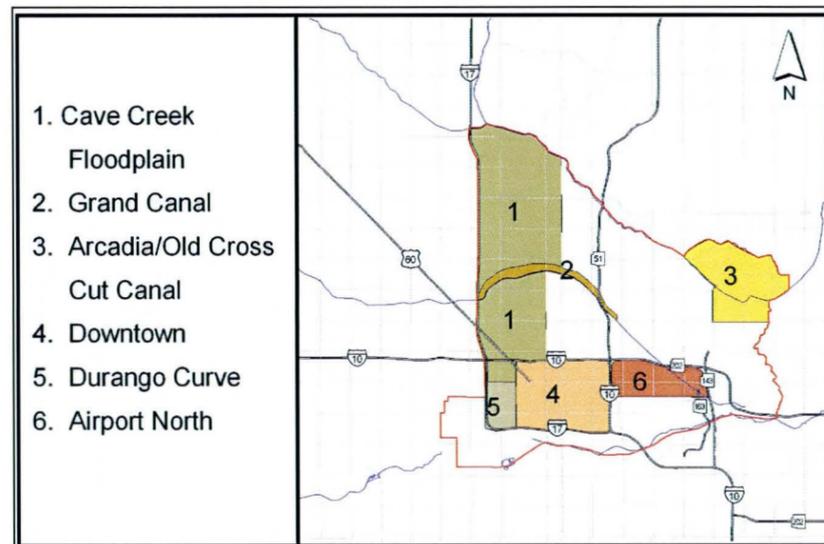


Figure 3 - Floodprone Areas

The Cave Creek Floodplain area from the Grand Canal downstream to I-10 is approximately six square miles in size, which incorporates the designated floodplain as well as some areas outside of the floodplain. The defined floodplain lies roughly between 19th Avenue to the west and 15th Avenue to the east, encompassing over 2,000 homes and businesses. However, the Metro Phoenix ADMP hydrologic model indicates that the risk of flooding in adjacent conveyance corridors, outside of the designated floodplain limits, is essentially the same as the flood risk within the floodplain. That is, the 100-year peak discharge

that is conveyed within the floodplain between 19th Avenue and 15th Avenue is roughly equivalent to the peak discharge in the other adjacent half mile wide conveyance corridors; including I-17 to 19th Avenue, 15th Avenue to 7th Avenue, and 7th Avenue to Central Avenue. As is the case with the Cave Creek Floodplain area upstream of the Grand Canal, the flooding problems downstream of the Grand Canal are primarily due to the topographic shape of the area which is a very wide, shallow conveyance corridor stretching from I-17 to Central Avenue. Runoff tends to concentrate within this area and, during times of heavy rainfall, runoff can exceed the capacity of the 2-year storm drain system and accumulate to significant depths, causing flood damage to those properties located in low-lying areas.

Grand Canal Floodplain: Homes along Grand Canal were built lower than the elevation of the banks of the Canal, creating a floodplain designation along the upstream (north) side of the canal. If the capacity of the City's storm drain system is exceeded, excess runoff backs up behind the canal banks and may cause flooding to homes and businesses.

The Grand Canal Floodplain between I-17 and 24th Street was identified as the floodprone area. Within this reach of the Canal, an estimated 530 homes, plus a number of businesses and apartment buildings, are located within the Grand Canal Floodplain. The floodplain actually reaches all the way east to 56th Street, but the largest accumulation of homes exists west of 24th Street. Some areas within the floodplain experience flooding on a much more frequent basis than others, such as the neighborhood located between 3rd Street and 12th Street. This area was flooded in the summer of 2007 and the summer of 2008, during storms that did not flood areas behind the Canal. Nonetheless, the entire floodprone area that lies below the elevation of the Canal bank is susceptible to flooding. Moreover, the flooding can be caused by storms much smaller than the 100-year event because the problem is a result of the homes lying lower than the Canal bank. That is, once the capacity of the 2-year storm drain system is exceeded, excess runoff ponds behind the Canal and causes flooding of the low lying homes and businesses.



Example of Local Street Flooding

Downtown Area: For purposes of this study, the Downtown area is defined as the 7.8 square mile region bounded by 19th Avenue on the west, I-10 on the north and east, and I-17 on the south. I-10 is a drainage divide for the Downtown area; capturing upstream runoff and conveying it to the Salt River through the ADOT tunnel system, but the local watershed still generates relatively high rates of runoff due to the level of development and lack of pervious areas. The hydrologic model indicates that surface flows run east to west through the Downtown area, with the highest concentrations of runoff occurring along Fillmore Street,

the Union Pacific Railroad, Buckeye Road, and I-17. The model indicates that these concentrations of runoff range from 100cfs to over 1200cfs for the 100-year flood, indicating a significant flood hazard. The flooding problems are exacerbated by the existence of a number of dysfunctional drywells that leave standing water after the storms have passed. In addition, even though 2-year storm drains exist on half-mile intervals, many of the inlets in the Downtown area seem inadequate to capture the runoff from a 2-year storm.



Flooding in Front of the Homeless Shelter – August, 2007

Durango Curve Area: The I-17 freeway is on an elevated embankment at Durango Street, and impounds floodwaters to a depth of about three feet, according to the effective floodplain map and verified with the Metro Phoenix ADMP hydrologic model. The flooded area is about a half square mile in size and includes about 670 homes and businesses along the east side of I-17, from the freeway curve upstream to the Union Pacific Railroad. The contributing watershed to the Durango Curve area extends all the way up to the ACDC. Storm water runoff from the watershed, that exceeds the existing storm drain system, concentrates along the north side of the Union Pacific Railroad and is diverted into I-17 filling the depressed part of the freeway north of the curve. Since the existing storm drain system is designed to convey the 2-year flood, storms exceeding the 2-year event can cause floodwater spilling into I-17. Once the storage volume of I-17 is exceeded, floodwaters spill over the east side of I-17 at Durango Street, flooding the area in the northeast quadrant of the curve. The west bank of the depressed freeway is higher than the east bank, which results in the spill to the east. This flooding problem not only impacts homes and businesses, but can also flood I-17, making the freeway impassable on a fairly frequent basis.

Arizona Country Club Swale: This swale is downstream of the Arizona Country Club, located between the Papago Buttes on the south and the elevated Arizona Canal on the north. The swale runs east to west through the Arizona Country Club and continues west, in an alignment north of Thomas Road, until it reaches the Old Cross Cut Canal at 48th Street. The swale tends to lose its definition downstream of 52nd Street, transforming from a swale that contains floodwater into a spread out surface flow. There are records of several flooding complaints from homeowners who live along the low-lying part of the swale.

Arcadia Area: The Arcadia area has long been a flooding concern for both the City and District. Storm water runoff from Camelback Mountain causes flooding problems for the homeowners whose property lies adjacent to the flow corridors. These flow corridors are the north-south aligned streets that convey the mountain runoff from Camelback Mountain's slopes down to the Arizona Canal. Once runoff reaches the Arizona Canal, it is impounded by the elevated embankment of the Canal, resulting in a designated floodplain along its upstream side. The residents at Camelback Castille, located on the upstream side of the

Canal at 40th Street and Camelback Road, have experienced flooding from this impoundment numerous times. These flooding issues in the Arcadia area have resulted in numerous flooding complaints, prompting the inclusion of Arcadia into the list of flood hazard areas.

Airport North: This area is located between the Loop 202 highway on the north and the Union Pacific Railroad on the south, from the I-10 freeway upstream to the State Route 143 (SR-143) freeway. The drainage area is approximately four square miles in size and the general fall of the land is from northeast to southwest. The railroad forms a drainage divide along the north boundary of Sky Harbor Airport. North of the railroad, a wide swale is formed along the Washington Street alignment where the grade is due west. This swale accumulates surface flow that exceeds the capacity of the existing 2-year storm drain system. According to the Metro Phoenix ADMP hydrologic model, the 100-year surface flow along Washington Street exceeds 1000cfs.

3.5 Scenery, Recreation and Open Space Resource Assessment (SRRA)

A required secondary goal of the Metro Phoenix ADMP is to develop flood mitigation solutions in ways that will preserve and enhance the valued scenic, open space and recreation resources and opportunities within the study area. This goal is derived from the District's mission and vision statements and its Board of Directors approved aesthetic treatment policy.

In response to this goal, a scenery, recreation and open space resource assessment (SRRA) was undertaken as part of the Level I and II data collection efforts for this ADMP. The following is a summary of the SRRA for the Metro Phoenix ADMP, and its use in the development of the recommended plan (see "*Metro Phoenix ADMP Level II Report*" under a separate cover for the complete SRRA report).

During the Level I Analysis, a comprehensive assessment of scenery, recreation and open space resources was undertaken utilizing information obtained from the District's County-wide SRRA. The information obtained from the District included baseline inventories of existing and future landscape character, landscape variety classes, visual sensitivity levels and existing recreation and open space resources in GIS. It also included analyses of the compatibility of these resources with a variety of different flood control structural methods in GIS which helped to define the constraints and opportunities for the solutions identified in the Level I and II alternatives. These compatibility assessments were used together with data pertaining to environmental and cultural resources, flooding conditions and hydrology within the study area in an effort to develop drainage solutions that are technically sound, environmentally sensitive, supported by the community, and complimentary to existing and planned future land use.

During the Level II Analysis, the information contained in the study area SRRA was further refined through field visits, discussions with land owners and site assessments that focused on areas that would be directly affected by the above ground structural solutions contained in the alternatives. The information developed in this phase was then used to refine the visual characteristics of the flood control features in the Level II Alternatives and Recommended Plan, including the identification of an appropriate landscape design theme, development of site layout designs, landscape contour grading designs, sketches and computer generated photo realistic simulations.

Following is a more detailed description of the project SRRA that was carried out for the Metro ADMP.

Scenery, Recreation, Open Space Goals & Objectives

The District’s goal for the landscaping and aesthetic treatment of flood control projects is to preserve the visual beauty and other aesthetic qualities of the urban, rural and natural settings in Maricopa County as an integral part of the planning and designing flood control facilities. The District’s recreation goal is to promote recreation multiple-uses of its properties to the extent that such uses do not compromise the flood control function, operation and maintenance of those facilities.

The purpose of the SRRA is to:

- ❖ Assess the character, quality and visual sensitivity of lands contained within and adjacent to the project area of influence;
- ❖ Provide an analysis of scenery and recreation opportunities and constraints for flood protection activities;
- ❖ Identify a range of appropriate landscape themes and associated landscape features to apply to the plan alternatives;
- ❖ Identify and develop plan alternatives that emphasize achievement of project landscape aesthetic goals;
- ❖ Provide an analysis of the scenic impacts, benefits and costs associated with plan alternatives;
- ❖ Identify recreation resources, needs, and opportunities;
- ❖ Assist in developing the preferred plan, including aesthetic planning and design guides, cost estimates for landscaping, aesthetic, and recreational features, and guidance on needed right-of-way acquisition; and
- ❖ Assist in development of the maintenance and implementation plan.

SRRA Data Collection

The Level I analysis of the Metro Phoenix ADMP included the data collection and assessment of the existing and planned future landscape character and recreational land use for the entire study area. This mapping was used to generate a landscape character compatibility analysis which identified the appropriateness of the various flood protection methods use in regards to landscape character within the study area. This county-wide data was appropriate for the regional context of the Metro Phoenix ADMP and the preliminary identification of the use of flood protection methods, but because of the intense urban development and varying landscape character contextual settings, a more local context assessment was made for the area surrounding the visually sensitive drainage alternatives identified.

An assessment was made for this area in regards to landscape character, scenic quality and visual sensitivity. The landscape character assessment included; existing, planned future, and historic and cultural landscape character. The scenic quality assessment included landscape variety and scenic integrity; this assessment identified features and areas that should be preserved for their outstanding scenic quality, and features and areas that may represent opportunities for landscape enhancement or improvement due to the lack of landscape variety or the presence of discordant features that appear to detract from the desired characteristics within the study area. And lastly, an assessment was made for visual sensitivity, taking into account the numbers and types of viewers; their concern for the visual environment; and the relative visibility of landscape areas within the study area.

3.6 Brainstorming Ideas

During the Level I analysis, the Stakeholders were invited to attend a brainstorming meeting focused on identifying potential solutions to the flooding problems described above. Each potential idea was recorded without bias or scrutiny so that a comprehensive list of potential ideas could be generated. Those ideas were the beginnings of the alternatives that would be reviewed at the end of Level I.

3.7 Formulation of Alternatives

After the brainstorming session every potential solution was carried forward and each was developed into its component parts. At the end of Level I the project team and Stakeholders met a second time to evaluate and rank those solutions and identify which alternatives would be carried forward into Level II. The potential solutions were evaluated based on feasibility with respect to serviceability, engineering design, construction, as well as operation and maintenance requirements. The “Metro Phoenix ADMP: Potential Alternatives Report: Level I Analysis” documents the alternatives selected for the Level II analysis which are summarized in Table 1.

Table 1 – Alternatives Carried forward to the Level II Analysis

Floodprone Area	Element	Description
Cave Creek	1	New Storm Drain in 21 st Avenue (10-Yr, Grand Canal to Northern Avenue)
	2	New Storm Drain Extension in Central Avenue (2-Yr, Bethany Home Road to Arizona Canal)
	3	New SD in 3 rd Avenue (10-Yr, Grand Canal to Bethany Home Road)
	4	Storage in Palo Verde Golf Course (10-Yr)
Cave Creek	5	Storage in Encanto Municipal Golf Course (10-Yr)
	6	New Storm Drain in 18 th Avenue (10-year, Encanto Golf Course to Grand Canal)
	7	New Storm Drain in Thomas Road (10-year, 24th Avenue to 18th Avenue)
	8	New Parallel Storm Drain in 15 th Avenue (10-year, Encanto Golf Course to Grand Canal)
	9	New Storm Drain in 3rd Avenue (10-year, I-10 to Grand Canal)
Grand Canal	10	Buyout, Demolish and Resale Lots within the Floodplain
Grand Canal	11	Linear Parks and Storage in Floodplain along the Grand Canal
Grand Canal	12	Floodproofing
Downtown	13	Modifications to 16 th Street Storm Drain
	14	Fillmore Street (East) Storm Drain
	15	9 th Street Storm Drain
	16	Fillmore Street (West) Storm Drain
	17	3 rd Avenue (North) Storm Drain
	18	Modifications to 15 th Avenue Storm Drain
	19	Modifications to 19 th Avenue Storm Drain
	20	7 th Street Storm Drain
	21	3 rd Avenue (South) Storm Drain
	22	7 th Avenue Storm Drain
Durango	23	New 100-Yr Storage Basin at Durango Curve with Conveyance to Salt River
	24	New 100-Yr Multiple Storage Basins at Durango Curve with Conveyance to Salt River
Arcadia	25	New 10-year Storm Drain in Thomas Road, Old Cross Cut Canal to 62 nd Street
Arcadia	26	10-year Camelback Road Collection System (Huitt-Zollars, Alternate 2)
Airport North	27	10-year Storm Drain in Van Buren Street, I-10 to 40 th Street

4.0 ALTERNATIVES ANALYSIS (Level II)

4.1 Alternatives Considered

The project team carried forward the selected alternatives from Level I and looked at each in greater detail, identifying potential utility conflicts, project costs, environmental impacts, historic and cultural impacts, as well as addressing aesthetic issues.

4.2 Environmental Considerations

As part of the Metro Phoenix ADMP process, an analysis was completed to identify environmental considerations including hazardous materials sites and facilities and previously identified cultural resources. Identification of these factors was used in the selection of the recommended alternative.

There is still considerable habitat value in the area, especially in areas with mature trees. These characteristics were looked at and their value was considered as part of the assessment.

A hazardous materials area of concern (HMAC) was identified (Figure 4) and a hazardous materials investigation was conducted. Arizona Department of Environmental Quality (ADEQ) and Environmental Protection Agency (EPA) databases were searched and the resulting information was reviewed to identify facilities or sites that have reported incidents involving hazardous materials. A total of 336 hazardous materials incidents or sites were recorded within the HMAC. The final Metro Phoenix ADMP project area and selected alternative(s) will need to be evaluated for specific hazardous materials impacts before plan implementation.

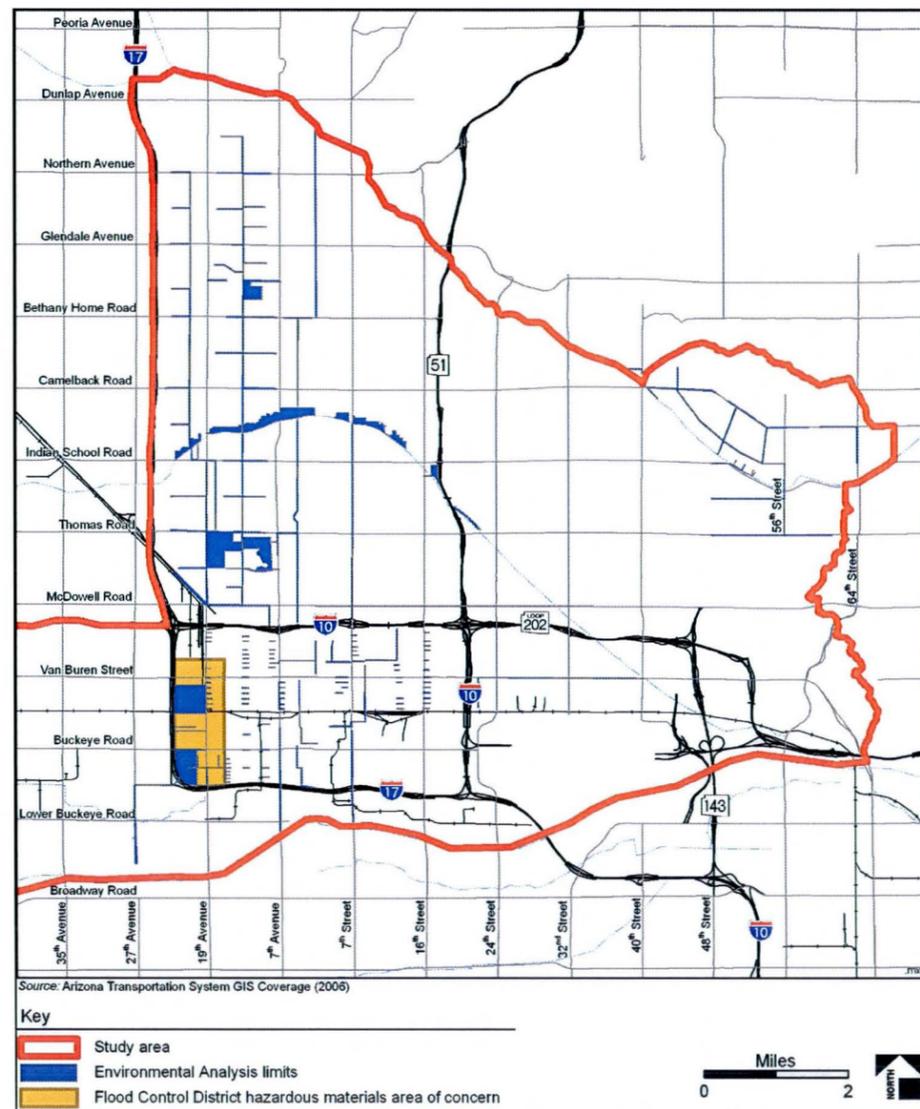


Figure 4 - HMAC Location

4.3 Cultural Resources Investigation

A cultural resources inventory area was identified (Figure 5) and a cultural resources investigation was conducted to identify any cultural resources in the inventory area that could be affected by the proposed Metro Phoenix ADMP alternatives. The investigation included background research to compile the previously documented archaeological and historic sites and surveys conducted. Cultural considerations were identified from information gathered from the Arizona State Historic Preservation Office (SHPO), Arizona State Museum, and National Park Service's National Register Information System.

The cultural resources records search indicated that 56 surveys were previously conducted in the inventory area, resulting in coverage of approximately six percent of the project area. In total, 53 known archaeological sites, 34 historic districts, and numerous National Register of Historic Places (NRHP) listing historic properties were previously recorded in the inventory area. Twenty-eight of these archaeological sites overlap the project area. Encanto Municipal Golf Course and Encanto Park both have historic designations. One alternative being proposed has a detention basin at I-17 and the Union Pacific Railroad that has homes with a historic designation within the footprint. If these alternatives move forward, the historic designation will need to be considered.

A more detailed assessment of known cultural resources is recommended prior to plan implementation. The level of detail needed, identification of potential agencies involved and construction related recommendations to preserve cultural resources are further described in the "Recommended Alternatives Analysis Environmental Considerations" prepared by Logan Simpson Design.

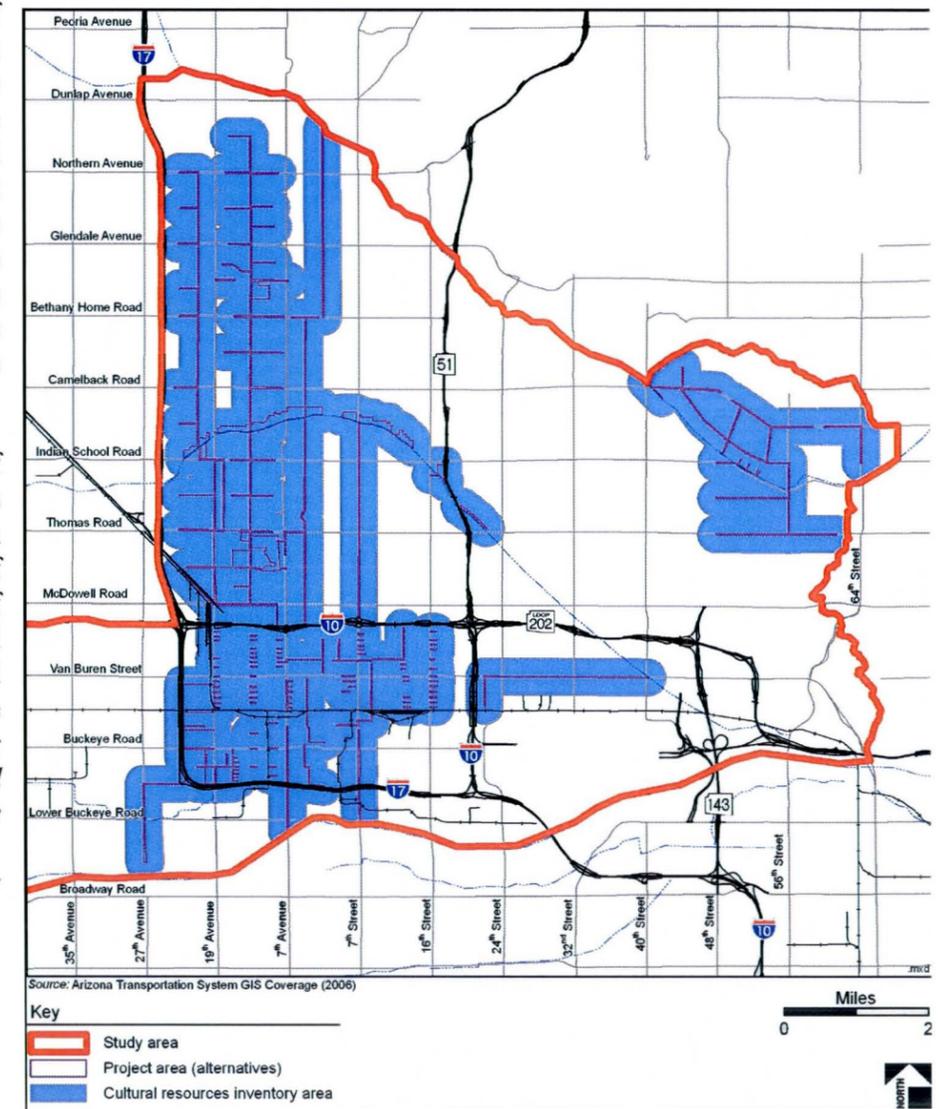


Figure 5 - Cultural Resource Inventory Area

4.4 Scenery, Recreation and Open Space Resource Assessment (SRRA)

SRRA Opportunities & Constraints Analysis

To assist in identifying the opportunities and constraints for applying the various flood protection methods, a composite map was produced for the local study area consisting of the Scenic Integrity ranges, the Visual Sensitivity Compatibility, Existing Landscape Character Compatibility, and Variety Classes Compatibility.

The scenery and recreation resource assessment identified areas that could be enhanced in both scenic quality and recreational use. Opportunity for enhancement exists south of Grand Avenue, where both scenic quality and recreational resources are lacking. The appropriate use of flood protection methods such as the Soft or Semi-Soft methods, along with including multi-use recreational components will significantly improve the harsh industrial character of the area, and provide needed recreation.

This assessment also identified an opportunity for local and regional recreational enhancement along the Grand Canal, in areas which currently fall within the Cave Creek Floodplain. Alternatives developed in this area could provide for the enhancement of existing regional pathway system along the canal, providing open space, pocket parks, trailheads, and general aesthetic improvements to the canal area.

Other opportunities for scenery enhancement presented themselves during team discussions about possible flood protection alternative solutions. Most notably are two municipal golf courses, which not only provide great floodwater storage opportunity, but also opportunity and desire of the City, to improve the aesthetics and appeal of the golf courses.

SRRA Landscape Design Themes

Along with the hydrologic engineering of the flood protection alternative solutions, landscape themes were prepared to help identify the future design of these alternatives which are suitable to the flood protection methods assessment, and the stakeholder's goals and objectives. These various themes were evaluated by the planning team, stakeholders, as well as general public.

Landscape design themes were identified for the flood protection alternative solutions which included above ground features which could have visual or recreational impacts in the study area. Alternative themes were developed for the Existing Landscape Character, Future Planned Landscape Character, and Historical Landscape Character, they include:

- ❖ Floodwater Storage at Encanto Municipal Golf Course Alternative

The Encanto Municipal Golf Course is located in the Encanto Palmcroft Historic District. The existing landscape character of the area is quite lush with palm trees, tall shade trees, and manicured turf and landscaping. In response to the Soft Structural Method anticipated for the site and the intended continued use as a golf course, the recommended landscape design theme is **Suburban Park-Like**. This theme emphasizes the aesthetic contouring of the golf course to provide the floodwater storage, and landscaping which would maintain the existing turf character of the course and preservation of mature trees.

- ❖ Floodwater Storage at Palo Verde Golf Course Alternative

Two alternative themes were developed: A **Suburban Park-Like** theme that uses aesthetic contouring of the golf course to provide the floodwater storage, and landscaping which would

maintain the existing all turf character of the course; and a second **Desert Oasis** theme, illustrated an alternative desert landscape theme on the edges of the golf course fairways.

- ❖ Durango Curve Alternative

Three themes were identified: **Suburban Park** Landscape Theme, **Enhanced Desert** Landscape Theme, and **Suburban Park Recreation Complex** Landscape Theme. The floodwater storage at the Durango Curve Alternative is not only ideally located for floodwater storage, but could also provide highly desired recreational facilities in the central part of the City. The City Parks and Recreation Department has also stated that they would welcome the opportunity for a new multi-use recreational facility at the locations of the two alternatives. The City Parks and Recreation Department has been unable to provide facilities in this area due to the lack of available property.

- ❖ Storm Drain in Central Avenue Alternative

Based on the Scenic Quality Assessment, the theme developed for Central Avenue was in response to the assessment of historic character, and the understood sensitivity to any aesthetic changes to Central Avenue and the Murphy Bridle Path. Developed from the use of the Semi-Soft Structural flood protection method, a **Historic Streetscape** theme illustrated the minimal degree of aesthetic changes required for the storm drain improvement, to satisfy the desire to maintain the existing historical landscape character.

SRRA Landscape and Recreation Design Guidelines

In addition to the hydrologic engineering review and evaluation, the various alternatives have been further refined and developed based on the information gathered with the SRRA and the public meetings. Design guidelines have been developed for the recommended alternatives based on the alternative's multi-use flood storage requirements and the alternative's theme developed from the SRRA. These concept design guidelines are provided in a combination of both a graphic site plan and written guidelines, for the alternatives which included above ground features which could have visual or recreational impacts in the study area.

4.5 Technical Analysis

Technical analysis during this phase of the project included the completion of the hydraulic model for the re-delineation of the existing Cave Creek Floodplain (see Section 2).

In addition to the floodplain analysis, the project team continued to evaluate alternatives for solving the flooding problems. This evaluation included documentation of the opportunities and constraints of each alternative, hydrologic modeling to develop estimates of the peak discharges at specific concentration points, and hydraulic calculations to determine pipe sizes for the storm drain alternatives. In addition, the team used the City's Geographic Information Systems (GIS) layers to identify major utility conflicts with sewer and water lines for each alternative.

4.6 Cost Estimate Assumptions

Detailed cost estimates were prepared for the storm drain and detention basin alternatives. The cost estimates were prepared for each element based upon the unit and quantity of materials necessary to construct that element. The costs for unit prices came from recently constructed City and District projects (construction bid tabulations from 2006).

The storm drain costs were based on liner foot of pipe. The cost per linear foot included cost of pipe, cost of manholes and catch basins per linear mile converted to a per linear foot cost, pavement and micro seal cost based on Maricopa Association of Government's (MAG) maximum trench width. It also included costs for removals, water and sewer adjustments, and other work; including traffic control. Once the total construction cost was calculated, 22% of the total was added for engineering design and construction administration.



Afshin Houraiyan presents at a Public Meeting July 31, 2007

The storm drain elements also included line items costs for major utility relocations. Line item costs were also added for junction structures, transition structures, and any other major features that would require special design.

The detention basin costs include the cubic yard of cut/fill material for the construction of basin storage areas, the cost of pipes, the cost of landscaping, the cost of real estate (for parcels not owned by the City) and any additional specially designed items. There is also an additional 20% contingency on the final cost of each element. The itemized cost for each storm drain and detention basin is included in the appendices of this report.

4.7 Public Meeting General Comments

Two public meetings were held during the Level II Analysis. The first one was on August 15, 2006 and the second series was on July 31 and August 7, 2007. The emphasis of these meetings was to discuss with the public the re-delineation of the Cave Creek Floodplain, present the developed alternatives for each floodprone area, and to determine the public preference for landscape aesthetic treatment that accompany the developed alternatives.

Many of the attendees were acutely interested in the outcome of the Cave Creek Floodplain re-delineation. In both the presentation and in one-on-one conversations the following was emphasized by the project team:

- ❖ The proposed floodplain re-delineation could remove the floodplain between the downstream side of the Grand Canal and McDowell Road.
- ❖ The floodplain re-delineation has been submitted to FEMA, but until FEMA approves the re-delineation the homeowners will be required to maintain their flood insurance.

- ❖ Once FEMA approves the propose re-delineation, homes in the area are still susceptible to local flooding. These homeowners are strongly encouraged to maintain flood insurance which they will be able to get at a reduced rate.

The developed alternatives were presented with a wide mixture of responses. In general, people were in favor of the majority of the alternatives that directly affect their neighborhoods. There was not public representation for every area at the public meetings; therefore feedback was not obtained for every alternative. Residents that live in the Grand Canal Floodplain were less pleased mainly due to the realization that the alternatives that could potentially help them are limited in scope with most of the alternatives involving the residents having to move out of the neighborhood.

In general, the public was disappointed that all of the alternatives, with the exception of the Downtown area where there is some funding available, are still years away from implementation. This was especially true of the residents within the Grand Canal Floodplain where some residents experience frequent flooding.

At the two public meetings, a series of presentation boards were set up for the public to view renderings of what the aesthetic treatments, for the alternatives, might look like. The public was then asked to fill out comment forms which included rating the public's choice of aesthetic treatment for the various alternatives. Approximately 100 people attended the first public meeting on July 31st while the second public meeting attendance was about 20 people. Table 2 summarizes the public's choices regarding aesthetic treatment.

Table 2 - Public Support of Aesthetic Treatment Options

Area of Interest	Theme	July 31, 2007 Public Meeting	August 7, 2007 Public Meeting
Cave Creek Floodplain	Central Avenue Historic Streetscape	supportive	unsure
(ACDC to Grand Canal)	Rehabilitated Golf Course w/Suburban Park Landscape	supportive	unsure
	Rehabilitated Golf Course w/Desert Oasis Landscape	supportive	unsure
Cave Creek Floodplain	Rehabilitated Golf Course w/Suburban Park Landscape	supportive	unsure
(Grand Canal to I-10)	Rehabilitated Golf Course w/Desert Oasis Landscape	split-good/bad	unsure
Grand Canal	Storage Basins Parks	supportive	unsure
	Retention Basin w/Suburban Park Landscape	unsure	not supportive
	Retention Basin w/Desert Oasis Landscape	unsure	not supportive
Arcadia Area	Natural Swale Landscape	supportive	unsure
Downtown Area	No Aesthetic Treatments Offered		
Durango Curve	Retention Basin w/Suburban Park Landscape	supportive	unsure
	Retention Basin w/Desert Oasis Landscape	supportive	unsure
	Retention Basin w/Suburban Park Recreation Complex	supportive	unsure
Airport North	No Aesthetic Treatments Offered		

4.8 Stakeholder Involvement

During Level II the stakeholders helped the project team identify issues relating to their specific organizations. The stakeholders then helped the team develop alternatives that resolved those issues and related the alternatives to the policy makers within their respective organizations with the goal of gaining

acceptance. The stakeholders also attended the regular meetings and helped out with the review of the developed alternatives and the selection of the recommended plan elements.

4.9 Criteria Used for Selection

The criteria used for the selection of the recommended plan included:

- ❖ Economic – considers design life as well as costs of implementation, construction and maintenance.
- ❖ Hydrologic – considers local and regional drainage benefits.
- ❖ Environmental – considers aesthetics, permitting, and wildlife habitat as well as cultural and hazmat impacts.
- ❖ Social – considers impact to historic neighborhoods, community acceptance, perceived benefit, multi-use opportunities, land acquisition, owner relocation and access during flooding.
- ❖ Feasibility – considers constructability, agency acceptance, and disruption during construction and financial partners.

4.10 Recommended Alternative Selection

Using the criteria described in Section 4.9 an alternatives ranking meeting was held to discuss the positive and negative benefits of each alternative. The meeting was attended by the project team, stakeholders and additional selected representatives of the District. The team used an alternatives evaluation matrix to categorize each of the criteria and rank the alternatives by greatest overall benefit. Table 3 summarized the elements selected for development of the recommended plan.

Table 3 - Elements Chosen for Recommended Plan

Area	Recommended Plan
Cave Creek Floodplain (ACDC to Grand Canal)	10-year storm drain system with storage at Palo Verde Golf Course ¹
Cave Creek Floodplain (Grand Canal to I-10)	10-year storm drain system with storage at Encanto Golf Course
Grand Canal Floodplain (I-17 to 24 th Street)	Final decision for Level II analysis was not reached
Downtown Area (between I-17 and I-10)	10-year storm drain system
Durango Curve Area	100-year collection system with single storage basin
Arcadia Area	Alternative 2 from Huitt-Zollars study supplemented by a new 10-year storm drain in Thomas Road
Airport North	10-year storm drain in Van Buren Street

Note 1: If the Palo Verde Golf Course is unavailable, the recommended plan is for the 10-year storm drain system without storage

5.0 RECOMMENDED ALTERNATIVES ANALYSIS (Level III)

Level III Analysis (Recommended Plan): The project team created 10-year hydrology models with sub-basins unique to the proposed storm drains so the peak discharges could be accurately defined. The team refined the designs and cost estimates and created conceptual plans which also identify utility conflicts.

5.1 Final Technical Analysis

Recommended Plan Analysis

The alternatives that were carried forward from the Level II analysis were further analyzed to design concept level and refining the associated cost. Additional criteria included identification of fatal flaws that would make a project impossible or impractical to construct. These included location of conflicting major utilities, impractical right-of-way acquisitions, and environmental and cultural impacts.

Refinements to the technical analysis included preparation of plan sheets identifying major utility conflicts for storm drain alternatives that show the potential street location of the new pipe and its relation to existing utilities. This helps estimate the associated costs of utility relocations. In addition, for the recommended plan elements that include storm water storage, new contoured basins were developed that provide the following:

- ❖ A better estimate of the storage volume was used as the basis of a stage-storage relationship within the HEC-1 modeling to determine the mitigating effect the storm water storage basin has on the flood hydrographs.
- ❖ An estimate of the quantity of haul material for the cost estimate.
- ❖ People a visualization of the storage basin and how the basin could be used for recreation. In the case of the golf courses, it also shows how the drainage will be routed through the basin to prove feasibility as well as refining the cost estimate.

Hydrologic Models for Recommended Plan

Wood/Patel prepared the overall 100-year proposed condition model for the entire watershed. EEC prepared the 10-year proposed condition models for the Recommended Plan for two areas, Cave Creek Floodplain and Downtown. The 100-year proposed condition model is used for the design of the Durango Curve detention basin and collection channel. The 10-year proposed condition model is used to size the proposed storm drains in the Cave Creek Floodplain and Downtown floodprone areas. The 100-year model includes 10-year storm drain diversions that were developed with the 10-year model.

The hydrologic models along with their documentation is included on the DVD at the beginning of the report. The recommended hydrology models and associated data (HEC-1 Schematic Maps, DDMSW files, and HEC-1 input and output files) can be found on this DVD. For a complete understanding of the hydrology, please see “*Hydrologic Study Report for Metro Phoenix Area Drainage Master Study/Plan*” prepared by Wood/Patel (October, 2006). There were custom values used for certain runoff parameters that differ from the District’s standard methodology. These custom values are explained in depth in the Wood/Patel report. The proposed condition models used the same principals as set forth in that report (which can also be found on the DVD at the beginning of the report). The following paragraph summarizes the overall hydrologic modeling approach.

The existing conditions hydrologic models were based on the following runoff parameters/methodology:

- ❖ Used the U.S. Army Corps of Engineers’ Flood Hydrograph Package (HEC-1)
- ❖ Used the new MCUHPI procedures from DDMSW 3.2.6
- ❖ NOAA Atlas 2 was used for the design precipitation

- ❖ Soil parameters were provided by the District in GIS format
- ❖ Land Use data was provided by the District in GIS format
- ❖ Green and Ampt Rainfall Loss Method
- ❖ Surface Retention Parameter (IA) were custom values (see Wood/Patel report for explanation)
- ❖ Impervious Area Percentage (RTIMP) were custom values (see Wood/Patel report for explanation)
- ❖ The capacity of existing storm drains was diverted out of the combined surface flow (it was assumed that each storm drain's inlet capacity was equal to, or greater than, its conveyance capacity)
- ❖ Storm Drain Diversions were routed using Kinematic Wave routing
- ❖ Cumulative Area Computation Data is reset downstream of basins

The following assumptions were made to prepare the proposed condition, 10-year models:

- ❖ The detention basins are modeled based upon the design concept plans for each (See Appendix E and Appendix H for plan sheets). That is, the stage-storage-discharge relationships for each basin are based on the concept plans.
- ❖ The basic assumption made was that all new proposed storm drains will collect and convey the 10-year flood from their associated watersheds. In some cases, there is flow-by at existing storm drains because they have insufficient capacity to convey the 10-year flow. But all of the new, proposed storm drains collect the 10-year flood, without any flow-by.
- ❖ In locations where the existing storm drain does not have capacity for the 10-year flows, the excess flow is diverted to the next downstream sub-basin until they are collected in a new, proposed storm drain or an existing storm drain that has extra capacity.
- ❖ The 10-year models result in design flows with associated watersheds for each new proposed storm drain. To size the proposed storm drain, EEC used the difference between the total flow and the capacity of the existing storm drain(s).
- ❖ In addition to the above assumptions, there are two key assumptions made for the Downtown area that are noted below:
 - It was assumed that the both proposed McDowell Road Storm Drain and the Encanto Golf Course Detention Basin are in place. The McDowell Road storm drain will cut off the flows to the existing 15th Avenue storm drain and the Encanto Golf Course Detention Basin significantly reduces flow in the existing 19th Avenue storm drain; freeing up storm drain capacity for the downtown area.
 - It is also assumed that, during a 10-year storm, no flow will cross through the assumed easterly drainage divide at I-10.

5.2 Environmental Considerations

Downtown and Durango Curve Recommended Drainage Plan – Hazardous Materials Areas of Concern (HMAC)

Within the Durango Curve floodprone area, a HMAC was identified that is bounded by Polk Street to the north, 17th Avenue to the east, and I-17 to the south and west (Figure 6). A hazardous materials investigation was completed for this area. The HMAC includes the proposed storm water detention basin at the Durango Curve as well as the storm water collection system that runs up the I-17 frontage Road.

Many of the structural components of the recommended drainage plan for the Durango Curve area are located within the HMAC. A hazardous materials records check of ADEQ and EPA databases was conducted in March, 2007 for the area within the HMAC. The results from the search identified facilities or sites that have reported hazardous materials incidents, such as improper storage, use, or transportation. Those search results were reviewed again in August, 2008 to determine which facilities, sites, or incidents

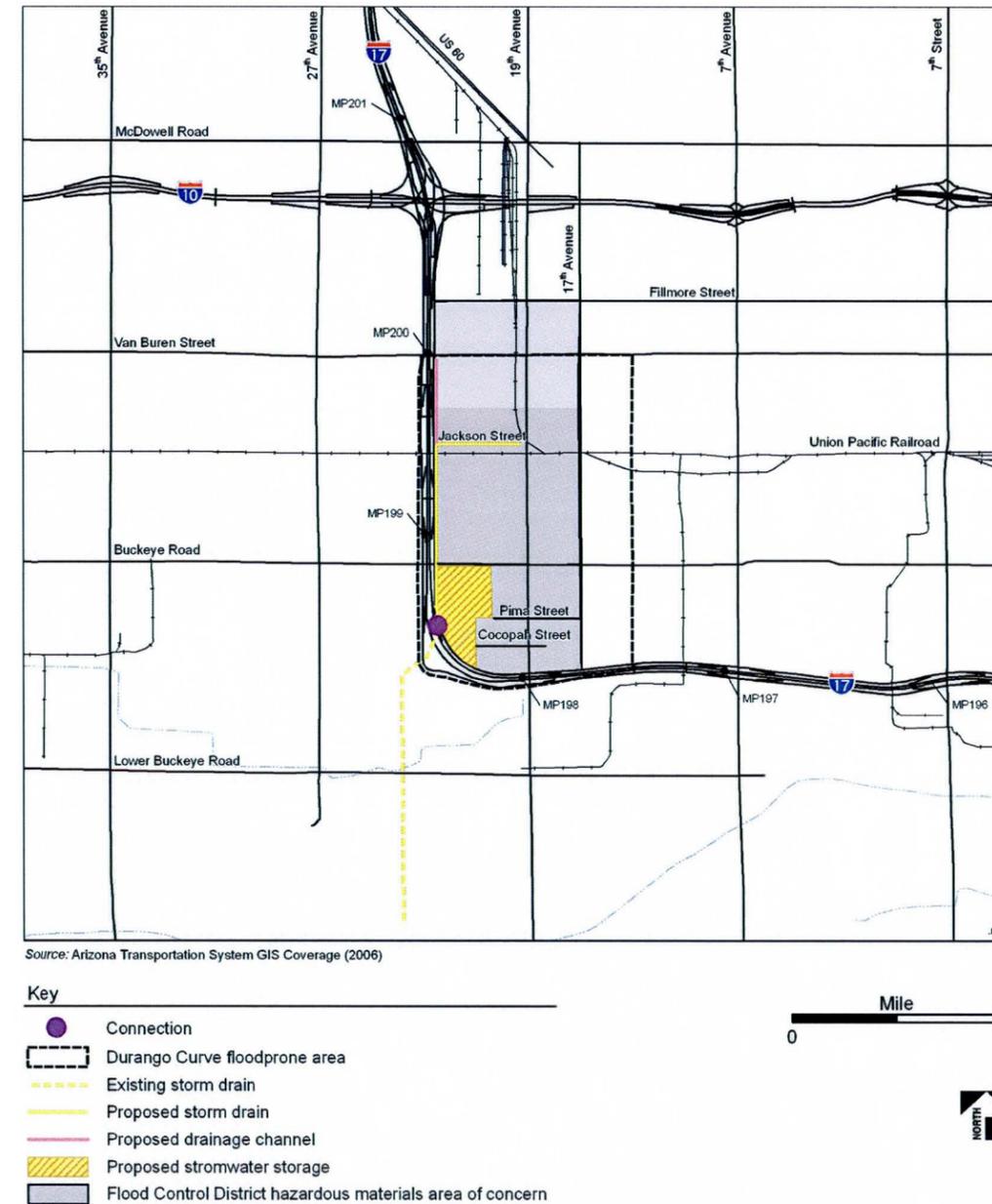


Figure 6 - Hazardous Materials Area of Concern and Durango Curve Floodprone Area

intersect or are immediately adjacent to the structural components of the recommended drainage plan for the Durango Curve area. Table 4 summarizes the facilities, sites, or incidents that intersect the structural components for this area.

Table 4 - Hazardous Materials Summary for Durango Curve Area

Type	Quantity	Type	Quantity
Active solid waste landfills	0	LUST's	2 LUST's that require remediation
Inactive solid waste landfills	0	CERCLA facilities	0
Septic landfills	0	RCRA sites	13
Septage hauler vehicles	0	TRIS	1
Waste tire collection facilities	0	AIRS/AFS sites	1
WQARF facilities	1	Portable AIRS/AFS operators	60
TSDFs	0	FRS facilities	2 (with a total of 3 incidents)
Drywells	8 drywells at 3 locations	ECHO facilities	9
HMIL incidents	12	NRC ERNS facilities	0
USTs	96 USTs at 22 locations (all tanks have been removed)	NFRAP facilities	3

Of the Hazardous Material Incident Logbook (HMIL) incidents, seven occurred along the Union Pacific Railroad line; however, attempts to contact the Union Pacific Railroad to determine more precise locations for these railroad incidents have not been successful. Future coordination with the Union Pacific Railroad will be needed to determine whether any of these incidents intersect or are immediately adjacent to the structural components of the recommended drainage plan for the Durango Curve area. Additionally, one ECHO incident, one AIRS/AFS operator, and one Permit Compliance System (PCS) water discharge permit occurred, operated or are issued for unknown locations along I-17 and along 21st Avenue. Further investigation is needed to determine whether these incidents intersect or are immediately adjacent to the structural components of the recommended drainage plan for the Durango Curve area.

Before construction of structural elements in the Downtown or Durango Curve areas, an additional or updated review of applicable ADEQ and EPA databases should be conducted to determine the presence of any additional incidents or to determine whether any cleanup efforts have been completed. The presence of hazardous materials sites may require remediation of the area, on-site monitoring, or other environmental mitigation measures.

Grand Canal Floodplain Recommended Drainage Plan – Hazardous Materials Areas of Concern

No structural components were identified for this area. However, the Floodprone Properties Assistance Program (FPAP) was presented and may result in District acquisition of properties that are subjected to

repetitive flooding. Currently, when the District acquires properties, structures are demolished. Before demolition of structures, the structures should be surveyed for hazardous materials, and if needed, a removal plan should be created and followed before demolition.

Arcadia, Cave Creek Floodplain, and Airport North Areas of the Recommended Drainage Plan – Hazardous Materials Areas of Concern

The Arcadia, Cave Creek Floodplain, and Airport North floodprone areas lie to the north and east of the HMAC and have not been evaluated for hazardous materials concerns. A hazardous materials records check of ADEQ and EPA databases will be required before construction of structural elements in this area. A records search will identify facilities or sites that have reported hazardous materials incidents, such as improper storage, use, or transportation. The presence of hazardous materials sites may require remediation of the area, on-site monitoring, or other environmental mitigation measures.

Overall Hazardous Materials Recommendation

Before implementation of structural components for the overall recommended plan, a hazardous materials records check of ADEQ and EPA databases will need to be conducted to identify facilities or sites that have reported hazardous materials incidents, such as improper storage, use, or transportation. Additional consultation with ADEQ and EPA will be necessary. In some instances hazardous materials monitoring may be necessary if construction occurs in the vicinity of a known incident, facility, or site. If construction takes place adjacent to a hazardous materials site, the type of environmental mitigation needed will be depend on the degree of disturbance and proximity to affected properties.

5.3 Cultural Resources Issues

Downtown and Durango Curve Recommended Drainage Plan – Cultural Resources Considerations

The proposed storm drains and storage basin within the Downtown and Durango Curve Recommended Drainage Plan Area intersect 10 archaeological sites, five historic districts, and numerous NRHP-listed properties. Two large Hohokam village sites, AZ T:12:70 (ASM) and P:2:3 (GP), and two smaller artifact scatters, AZ T:12:43 (ASM) and AZ T:12:72 (ASM), have also been recorded within the drainage plan area. In addition, unnamed prehistoric canal alignments cross the area at 25 locations. Most of the drainage plan area is located within the Phoenix Commercial Multiple Resource Area. The historic sites in the drainage plan area include:

- ❖ AZ T:12:222 (ASM)/Salt River Valley Canal
- ❖ AZ FF:9:17 (ASM)/State Route 80
- ❖ AZ T:12:45 (ASM)/Hotel Westward Ho
- ❖ AZ T:10:84 (ASM)/Southern Pacific Railroad
- ❖ AZ T:12:244 (ASM)/Phoenix Street Railway
- ❖ AZ T:12:56 (ASM), trash dump

The project area is also located within portions of five historic districts listed in the NRHP, the Phoenix Historic Property Register (PHPR), or both registers:

- ❖ North Garfield
- ❖ Garfield

- ❖ Phoenix Union High School
- ❖ Roosevelt
- ❖ Mathew Henson Public Housing Project

Each of these historic districts is composed of numerous historic buildings, which are considered elements that contribute to each district's significance. Because there are numerous historic properties, they are not discussed individually.

Archaeological monitoring may be necessary if construction occurs within or in the vicinity of the archaeological sites and canals. Typically, monitoring is required when construction occurs within 100 feet of a projected canal alignment or site boundary. When construction activities occur within a historic district, emphasis must be placed on protecting the character of the district. If the properties cannot be avoided, the level of investigation may include photographing and documenting historic buildings and conducting cultural resources monitoring. Because one of the segments of the recommended plan crosses historic SR 80, AZ FF:9:17 (ASM), consultation with ADOT may be necessary. Usually, the effect of construction on a segment of an NRHP-eligible road can be mitigated by photographing and documenting the road segment and its associated features.

Arcadia Recommended Drainage Plan – Cultural Resources Considerations

The proposed storm drains within the Arcadia/Old Crosscut Canal area intersect one NRHP-eligible historic site, AZ U:6:303 (ASM)/Arizona Canal, which is owned by the Bureau of Reclamation (Reclamation) and operated by SRP. One component of the recommended plan is adjacent to the NRHP-listed Charles H. Pratt House, which is significant for its mid-twentieth-century architecture and engineering.

Because the recommended plan within this area intersects the NRHP-eligible Arizona Canal, consultation with Reclamation may be necessary. Photographic documentation and archival research may be required if construction is expected to affect the Canal. Although one component of the recommended plan is adjacent to the NRHP-listed Charles H. Pratt House, careful planning of construction activities could avoid any effect on the property.

Cave Creek Floodplain Recommended Drainage Plan – Cultural Resources Considerations

The proposed storm drains within the Cave Creek Floodplain recommended drainage plan area intersect two archaeological sites, 11 historic districts, and numerous NRHP-listed properties. In addition, unnamed prehistoric canal alignments cross the area at 16 locations. AZ T:7:167 (ASM)/Grand Canal could be affected by proposed storm drains and a storage basin that are part of the Cave Creek Floodplain plan. The Grand Canal is owned by the Reclamation and operated by SRP. AZ T:12:10 (ASM)/Las Colinas is a large Hohokam village site that has been determined eligible for listing in the NRHP. The project area is also located within portions of 11 historic districts that are listed in the NRHP, the PPHR, or both registers:

- ❖ Medlock Place
- ❖ Pierson Place
- ❖ Encanto-Palmcroft
- ❖ Margarita Place
- ❖ Encanto Manor
- ❖ Encanto Vista

- ❖ North Encanto
- ❖ Woodlea
- ❖ Campus Vista
- ❖ Yapple Park
- ❖ Willo

Each of these historic districts is composed of numerous historic buildings, which are considered elements that contribute to each district's significance. Because there are numerous historic properties, they are not discussed individually.

Because a component of the recommended plan intersects the NRHP-eligible Grand Canal, consultation with the Reclamation may be necessary. Photographic documentation and archival research may be required if construction is expected to affect the canal. Archaeological monitoring may be necessary if construction occurs within or in the vicinity of the archaeological sites and canals. Typically, monitoring is required when construction occurs within 100 feet of a projected canal alignment or site boundary.

When construction activities occur within a historic district, emphasis must be placed on protecting the character of the district. If the properties cannot be avoided, the level of investigation may include photographing and documenting historic buildings and conducting cultural resources monitoring. One component of the recommended plan includes construction of a storage basin east of 15th Avenue within the Encanto Golf Course, which is part of the NRHP-listed Encanto-Palmcroft Historic District. Encanto Park, which includes the golf course, a lagoon system, picnic areas, and a wide variety of trees, was modeled after large naturalistic English-style parks such as New York's Central Park and San Diego's Balboa Park. A second proposed storage basin, within the Palo Verde Golf Course, could affect the William McElroy Farm, a property that has been recommended eligible to the NRHP. The William McElroy Farm consists of a farmhouse and surrounding buildings that were constructed in the 1930s.

Grand Canal Floodplain Recommended Drainage Plan – Cultural Resources Considerations

Within the Grand Canal Floodplain recommended drainage plan area, two historic districts (Yapple Park and Pierson Place), one NRHP-listed property (Brophy College Chapel), and five unnamed prehistoric canal alignments could be affected by the proposed plan. Archaeological monitoring may be necessary if construction occurs within or in the vicinity of the canals. The Brophy College Chapel is significant for its Mission/Spanish Revival-style architecture. Typically, monitoring is required when construction occurs within 100 feet of a projected canal alignment. When construction activities occur within a historic district, emphasis must be placed on protecting the character of the district. If the properties cannot be avoided, the level of investigation may include photographing and documenting historic buildings and conducting cultural resources monitoring. If demolition of structures is considered by the District for properties acquired under the FPAP, an assessment of age and significance should be made under the City Historic Preservation Office before demolition, to comply with the City Historic Preservation Ordinance.

Airport North Recommended Drainage Plan – Cultural Resources Considerations

The proposed storm drain within the Airport North Recommended Drainage Plan area intersects three archaeological sites and seven unnamed prehistoric canal alignments. AZ FF:9:17 (ASM) is the historic SR 80, which has been determined eligible for listing in the NRHP. AZ T:12:1 (ASM)/La Ciudad is

a large Hohokam village also determined eligible for listing in the NRHP. AZ T:12:222 (ASM)/Salt River Valley Canal was constructed in A.D.1868 and has been recommended eligible for listing in the NRHP.

Archaeological monitoring may be necessary if construction occurs within or in the vicinity of the archaeological sites and canals. One component of the recommended plan crosses historic SR 80; therefore, consultation with ADOT may be necessary. Usually, the effect of construction on a segment of NRHP-eligible road can be mitigated by photographing and documenting the road segment and its associated features.

Overall Cultural Resources Recommendation

The records search indicated that most of the project area has not been surveyed for prehistoric and historic resources; therefore, significant resources may be located within the project area that has not yet been identified. However, the four recommended drainage plan areas have been heavily developed, and archaeological survey may not be feasible, though additional historic property survey and archival research may be required. Archaeological monitoring or testing may be necessary if construction occurs in the vicinity of a known site. If construction takes place within a historic district, the type of cultural resources work needed will depend on the degree of disturbance and its proximity to contributing properties.

Implementation of the recommended drainage plan will require consultation with SHPO, the City Archaeology Office, the City Historic Preservation Office, and possibly SRP, Reclamation, and ADOT. The City Archaeology Office and the City Historic Preservation Office will evaluate the components of the recommended plan for their potential to affect archaeological sites and historic properties, and will prepare assessment forms that describe the recommendations made concerning the need for additional archaeological investigations (City Guidelines for Archaeology, 2006; City Historic Preservation Ordinance). If proposed construction cannot proceed without impacting existing or newly discovered NRHP-eligible cultural resources, those resources must be treated in a way consistent with applicable city, state, and federal laws, in consultation with the appropriate agencies.

5.4 Social Considerations

Downtown and Durango Curve Recommended Drainage Plan – Social Considerations

Public comments indicated a high level of support for storm drains both north and south of the railroad. The recommended drainage plan incorporates storm drains in these locations for the Downtown area. For the Durango Curve area, public comments indicated that residents are either not sure or somewhat supportive of a new storm drain system with storm water storage. The recommended drainage plan for this area incorporates a new storm drain system and storm water storage at the Durango Curve. Commercial landowners affected by the proposed basin are concerned with the effects of the plan on property values in the area. The commercial property owners suggest rebuilding the nearby public housing development project to retain some of the commercial properties. The adjacent housing development is operated by the US Department of Housing and Urban Development (HUD). Any impacts on this development would require future coordination with HUD.

Arcadia Recommended Drainage Plan – Social Considerations

Public comments indicated a high level of support for a new storm drain system for the Arcadia area. The recommended drainage plan incorporates a new storm drain system in this area. Both the new storm drain and the natural swale landscape theme selected for this area are supported by the public.

Cave Creek Floodplain Recommended Drainage Plan – Social Considerations

Public comments indicated a high level of support for new storm drains and floodwater storage at the Palo Verde and Encanto Golf Courses. Within the Cave Creek Floodplain area, the recommended drainage plan incorporates new storm drains and floodwater storage at both the Palo Verde and Encanto Golf Courses. The suburban park landscape theme selected for the two golf courses is highly supported by the public.

Grand Canal Floodplain Recommended Drainage Plan – Social Considerations

Public comments initially indicated a high level of support for storage basins and parks in the Grand Canal Floodplain area; however, further discussion with individual landowners indicated a low level of support for the buyout of homes needed to create the new storage basins. Given public feedback, the recommended drainage plan for this area does not incorporate structural components. Instead, residents were informed about the FPAP. The FPAP is intended for properties that are in a designated FEMA floodplain, and are subject to repetitive flooding. FPAP participation by property owners is voluntary; however, selection for aid is not automatic. FPAP-eligible properties are compared to others in Maricopa County that submit to the program, and are prioritized through a ranking system. Funding determines the number of properties that can be selected annually. Residents in the area are divided on their support for the FPAP for several reasons: application to the FPAP does not guarantee selection for aid, which is limited and competitive; acquisition of properties may result in their demolition and the subsequent public auction of the land; removing structures creates vacant lots, which can create a disjointed neighborhood; and once a lot is sold, deed restrictions require that the new owner elevate the home, which can create an uneven horizon in the neighborhood. The District recognizes that further study of this area may be needed to determine a better solution for the area. The District is working with SRP, which administers the Grand Canal, to try to create additional drainage solutions for this area.

Airport North Recommended Drainage Plan – Social Considerations

Public comments indicated a high level of support for a new storm drain for the Airport North area. The recommended drainage plan incorporates a new storm drain in this area at Van Buren Street.

Overall Social Considerations Recommendation

Overall public comments, with the exception of those for the Grand Canal Floodplain area, have supported the overall recommended plan. The public was invited to participate in a series of four public meetings for the project. Public comments helped to shape the different project alternatives and to select the components of the overall recommended drainage plan. As funding becomes available for each of the different structural components of the plan, local-area residents should be informed of the planned improvements.

5.5 Landscape Design Guidelines

5.5.1 Palo Verde Golf Course

Proposed Detention Basin and Rehabilitated Golf Course

This recommended alternative provides multi-purpose opportunity that would improve both flood protection and recreation use. The reconstruction of the golf course would create a multi-use facility by providing floodwater storage, and by improving the course's golf marketing appeal and aesthetic qualities.

In conjunction with other storm drain improvements, as a floodwater storage facility, the golf course will reduce the frequency of flooding by increasing the capacity of the local drainage system from a 2-year

system to a 10-year system. The golf course will provide significant storm water capacity by lowering the fairways and non-play areas of the course in a terracing fashion approximately 5 feet – 15 feet below street level. The design of the golf course/flood storage facility shall be sensitive to the landscape character of the surrounding neighborhoods and designed to blend with the adjacent properties.

Landscape Design Theme

The Suburban Park Landscape Design Theme was chosen for Palo Verde Golf Course based on its existing contextual landscape setting. Turf, palms, mature shade trees, and lush green shrubs are the dominant vegetation that comprises the surrounding residential landscape setting. There are a few homes that have converted to desert landscaping, which are exceptions to the fairly intact lush landscape character of the surrounding neighborhoods. This theme is reinforced by the City Parks and Recreation Department's desire to preserve the turf park character for their parks that lie south of the Arizona Canal.

This theme consists of flood control structures that accentuate natural organic topographic forms and create landscape variety and visual interest. Surface treatments consist primarily of turf with inert materials in non-use areas. Plant materials consist of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space.

Landscape and Recreation Design Guidelines

During this ADMP study process, discussions with the stakeholders developed several recommendations and guidelines that shall be addressed during the design process for the rehabilitated golf course. A golf course architect will need to be involved in this effort to ensure that proper golf course design and construction requirements are achieved. In addition to typical golf course design elements, unique elements and considerations brought about from the multi-use flood storage requirements will need to be addressed. The general design recommendations are included in Appendix E.

5.5.2 Encanto Golf Course

Proposed Detention Basin and Rehabilitated Golf Course

This recommended alternative provides multi-purpose opportunity that would improve both flooding issues, and recreation use. The reconstruction of the golf course would create a multi-use facility by providing floodwater storage, and by improving the course's golf marketing appeal and aesthetic qualities.

In conjunction with other storm drain improvements, as a floodwater storage facility, the golf course will reduce the frequency of flooding by increasing the capacity of the local drainage system from a 2-year system to a 10-year system. The golf course will provide 400 acre-feet of storm water storage by lowering the fairways and non-play areas of the course in a terracing fashion approximately 5 feet – 15 feet below street level. The design of the golf course/flood storage facility shall be sensitive to the historic nature of the existing golf course and surrounding neighborhoods.

Encanto Golf Course, built in 1935, is the third oldest course in Arizona and lies within the historic Encanto-Palmcroft Historic District. Although the course's historic nature and central Phoenix location are positive qualities, in terms of golf, the course's interest and physical conditions could be improved. The rehabilitation of the golf course should focus on its economic performance, while preserving or improving the quality of its existing assets. Compared to newer golf courses, the monotonous character of Encanto is not as desirable to many golfers. While the flat nature of the existing topography is well suited for the average golfer, a more challenging course would draw interest from a wider variety of golfers.

Landscape Design Theme

A Suburban Park Landscape Design Theme has been chosen for Encanto Golf Course to preserve its historic contextual landscape setting. The surrounding landscape setting consists of palms, mature trees, manicured lawns, and highly maintained historic neighborhoods. This theme is reinforced by the City Parks and Recreation Department's desire to preserve the turf park character for their parks that lie south of the Arizona Canal.

This theme consists of flood control structures that accentuate the natural topography and create landscape variety and visual interest. Surface treatments consist primarily of turf, with plant materials consisting of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space.

Landscape and Recreation Design Guidelines

During this ADMP study process, discussions with the stakeholders developed several recommendations and guidelines that shall be addressed during the design process for the rehabilitated golf course. Certainly, a golf course architect will need to be involved in this effort to ensure that proper golf course design and construction requirements are achieved. In addition to typical golf course design elements, unique elements and considerations brought about from the multi-use flood storage requirements and the area's historic character will need to be addressed. The general design recommendations are included in Appendix H.

5.5.3 Durango Curve Detention Basin

Proposed Detention Basin with Recreation Complex

The redevelopment of this area from industrial to multi-use floodwater storage and recreational open space would eliminate the Cave Creek Floodplain, preclude flooding of the I-17 freeway, provide an outfall for new upstream storm drains, provide needed recreational amenities, and enhance the visual character of the area

In conjunction with other upstream storm drain improvements, the Durango Curve basin will provide storage for the 100-year flood.

Landscape Design Theme

The Suburban Park Recreational Complex Landscape Design Theme was chosen for the Durango Curve basin based on input from the City Parks and Recreation Department's desire for needed sports fields in this area of the City, and input from citizens at the public meetings.

This theme consists of flood control structures that accentuate the natural topography and create landscape variety and visual interest. Surface treatments consist primarily of turf with inert materials in non-use areas. Plant materials consist of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space. The general design recommendations are included in Appendix V.

5.6 Cost Estimate Analysis

Detailed cost estimates were prepared for the storm drain and detention basin alternatives. The cost estimates were prepared for each element based upon the unit and quantity of materials necessary to construct that element. The costs for unit prices came from recently constructed City and District projects (construction bid tabulations from 2006).

The storm drain costs were based on liner foot of pipe. The cost per linear foot included cost of pipe, cost of manholes and catch basins per linear mile converted to a per linear foot cost, pavement and micro seal cost based on Maricopa Association of Government's (MAG) maximum trench width. It also included costs for removals, water and sewer adjustments, and other work; including traffic control. Once the total construction cost was calculated, 22% of the total was added for engineering design and construction administration.

The storm drain elements also included line item costs for major utility relocations. Line item costs were also added for junction structures, transition structures, and any other major feature that would require special design.

The detention basin costs include the cubic yard of cut/fill material for the construction of basin storage areas, the cost of pipes, the cost of landscaping, the cost of real estate (for parcels not owned by the City) and any additional specially designed items. There is also an additional 20% contingency on the final cost of each element. The itemized cost for each storm drain and detention basin is included in the appendices of this report.

5.7 Final Public Meeting General Comments

At the conclusion of the Level III analysis the project team held a public meeting to present the results of the study to the public. Prior to the meetings the public was notified by newspaper advertisements and individual mailers. The project team prepared handouts to distribute at the meeting as well as exhibit boards to present to the public.

The meetings were held on August 6th and 7th, 2008. At each meeting a PowerPoint presentation, by the District's project manager (Afshin Ahouraiyan) was followed by a question and answer session and an open house forum where meeting participants were invited to view display boards and ask questions of project team members. At each meeting a sign-in sheet was used to record attendance and comment sheets were provided to give the attendees an opportunity to submit written comments.

Overall the meeting participants expressed satisfaction with the recommended plan. The following general comments were made:

- ❖ Many of the attendees had come to find out if their properties had been removed from the floodplain and the majority expressed satisfaction at the outcome of the floodplain study.
- ❖ Several attendees expressed interest in the FPAP and asked questions regarding how that program works.
- ❖ Several attendees expressed satisfaction that the buyout option had been removed for the Grand Canal Floodplain area but were disappointed that there was no structural solution for this area. A suggestion was raised to continue studying the Grand Canal Floodplain area.
- ❖ Several business owners from the Durango Curve area expressed concern that only the industrial/commercial areas are affected by the buyout proposed with the recommended plan. Although the business owners understood the need for the County housing project they brought up the point that the housing is obsolete and needs refurbishing. They think that the buyout should include a mix of all three industrial, commercial and residential.

- ❖ Several attendees were dissatisfied with the overall plan because it does not provide relief of flood insurance premiums in all areas. It was explained that the recommended plan is primarily a 10-year solution with 100-year protection along the Cave Creek Floodplain and in the Durango Curve area.
- ❖ Many of the attendees expressed interest in the implementation of the projects and were concerned that the recommended plan does not have a definitive time frame and that there is currently no funding aside from some of the Downtown area.

6.0 RECOMMENDED PLAN

The following sections contain a summary description of the recommended plan for each floodprone area; including the total estimated construction costs for each major element of the plan. Within the appendices, each major element is further described in more detail which includes hydrologic data, conceptual plan sheets, and itemized cost estimates.

6.1 Overall Description

In general, the recommended plan for the Metro Phoenix ADMP is to provide a 10-year level of flood protection for those areas within the study limits that have been identified as being floodprone. That is, once all of the projects identified in each floodprone area are designed and constructed, that area will be protected from a 10-year flood. This increased level of flood protection represents a significant upgrade to the City's existing storm drain system which only provides 2-year protection. Total cost of the plan is approximately \$366 million and includes improving the existing storm drains, construction of about 35 miles of new storm drains and three new storm water detention basins.

The exceptions to the recommended 10-year level of flood protection include the proposed Durango Curve detention basin, Central Avenue storm drain and Grand Canal Floodplain. In the case of the Durango Curve detention basin, it is designed to contain the 100-year flood in order to eliminate the downstream Cave Creek Floodplain. The Central Avenue storm drain, on the other hand, is designed for the 2-year storm since it is limited by the capacity of its outfall into the existing 2-year storm drain at Central Avenue and Bethany Home Road. This 2-year storm drain, however, is an integral part of the Cave Creek Floodplain 10-year system, combining with the other elements of the plan to provide the overall 10-year protection for the Cave Creek Floodplain area. In the case of the homes in the Grand Canal Floodplain, voluntary participation in District's FPAP is recommended. The Grand Canal Floodplain properties between I-17 and Central Avenue will receive a 10-year level of flood protection from the proposed Cave Creek Floodplain 10-year storm drain system, but the rest of the properties along the Canal will not benefit from the new 10-year storm drain systems. Therefore, it is also recommended that the Grand Canal Floodplain drainage problems be further studied to investigate the potential for cost effective structural solutions within an expanded study area to include the entire floodplain from 56th Street to 63rd Avenue.

The recommended plan for the Cave Creek Floodplain area consists of a 10-year storm drain system that includes six new storm drains along with storm water detention basins at Palo Verde and Encanto Golf Courses. The new storm drains and storage basins are designed to supplement the existing 2-year system in order to provide an upgraded, overall 10-year level of flood protection. The storage basins result in a

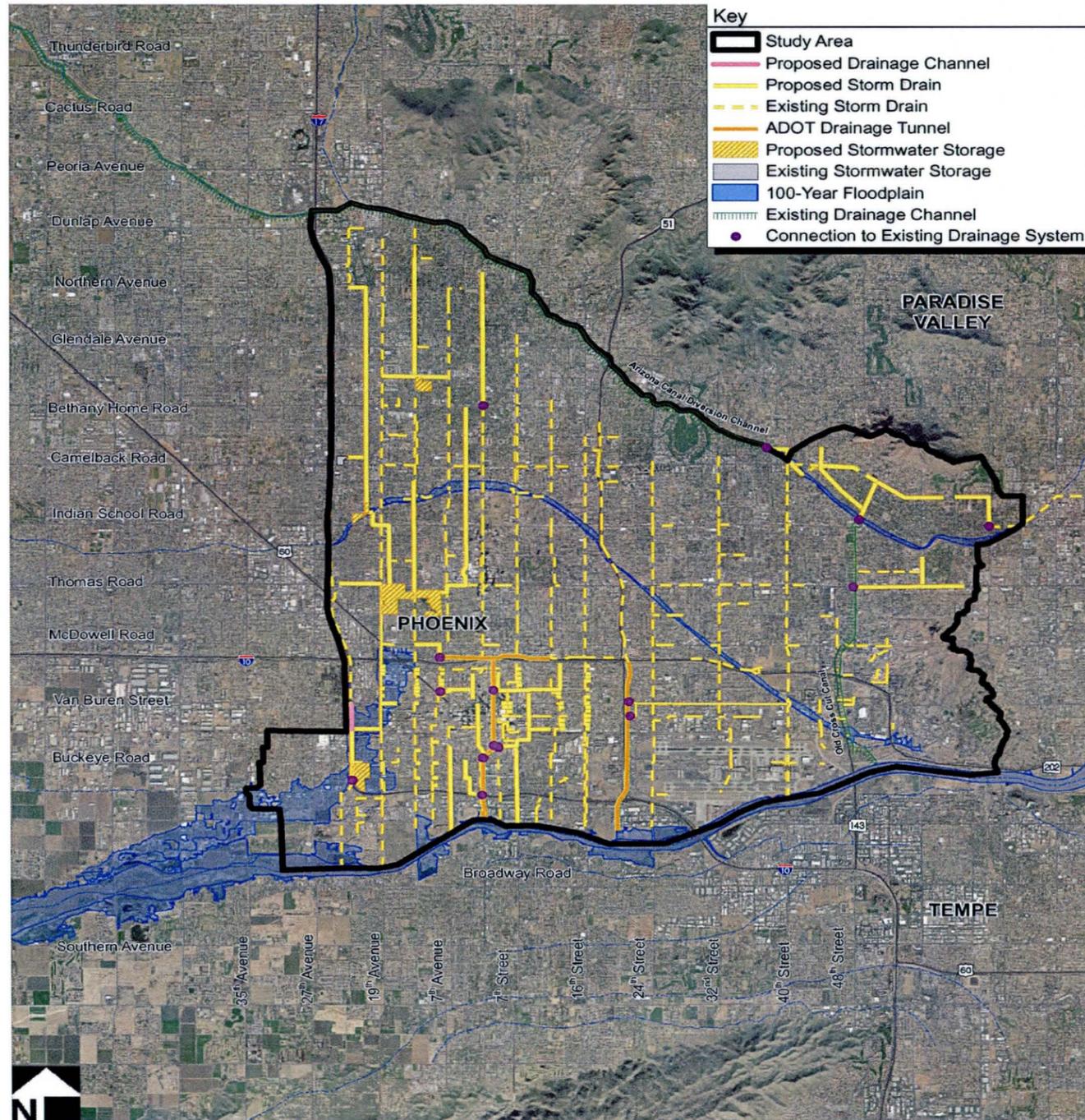


Figure 7 - Location of Proposed Drainage Improvements

significant decrease in peak flow within the existing downstream storm drains which enables the proposed storm drain system to discharge to ADOT's drainage system at I-10, rather than running all the way out to the Salt River. Similarly, the recommended plan includes an upgrade of the Downtown storm drain system wherein new storm drains are added to supplement the existing storm drains to provide an overall 10-year level of flood protection.

The plan also includes a new 10-year storm drain system in the Arcadia area and, since there is no existing 2-year storm drain system in the Arcadia area, it will represent a tremendous upgrade from the existing surface drainage system. In addition, a new 10-year storm drain is proposed in Van Buren Street in the area north of the Airport which will discharge to ADOT's east tunnel along I-10. This new storm drain will collect storm water from the existing upstream storm drains in 24th Street, 32nd Street and 40th Street allowing the City's Aviation Department to utilize the capacity of these three storm drains within the Airport property to upgrade the Airport's drainage system.

6.2 Cave Creek Floodplain Plan

The recommended plan for the Cave Creek Floodplain area is to increase the capacity of the existing 2-year storm drain system to provide a 10-year level of flood protection. The plan also calls for diverting the outflow from the existing 15th Avenue storm drain into the I-10 storm water interceptor, south of McDowell Road at 9th Avenue. Discharging to the I-10 storm water interceptor will free up the capacity of the existing 15th Avenue storm drain south of I-10, allowing it to provide an outfall for collecting runoff in the Downtown area. Major elements of the

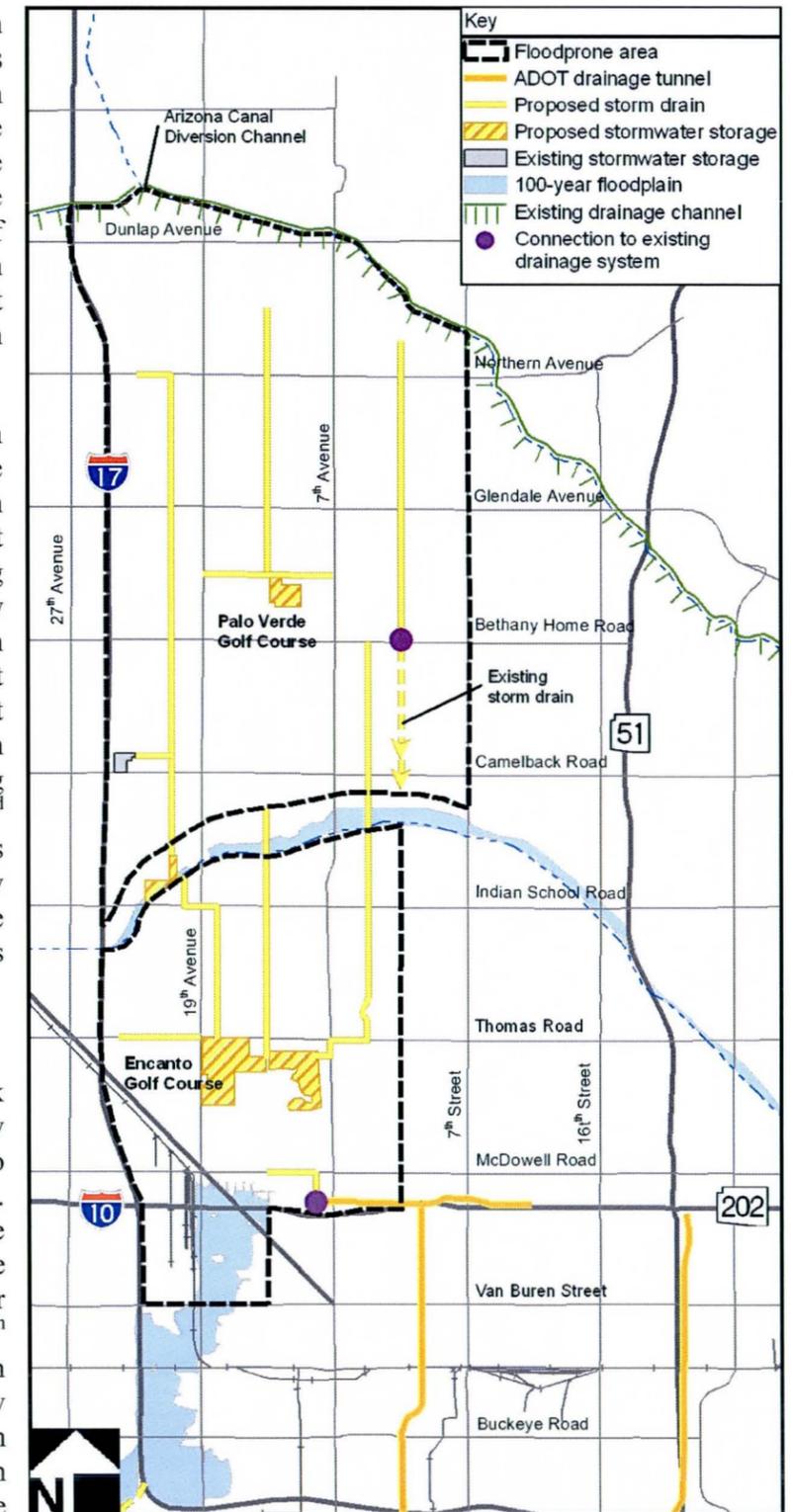


Figure 8 - Recommended Plan for the Cave Creek Floodplain Area

Cave Creek Floodplain plan include six new storm drains and two new detention basins.

Incorporating detention basins enables the storm drain system to be upgraded to a 10-year level of protection without having to construct any new storm drains out to the Salt River. The proposed new detention basins are located within the existing Palo Verde and Encanto Golf Courses.

The plan is to rebuild the golf courses with a contoured appearance that improves their playability and aesthetic appeal while providing enough storm water storage capacity to contain the 10-year flood. The system is designed to allow runoff from low-flow events to continue downstream in the existing storm drains, bypassing the golf courses. In that way, the small storm events will not impact play on the golf courses; only runoff from larger storms will be diverted into the golf courses. The stored runoff will drain back into the City's storm drains after the storm passes, allowing the courses to be playable within a day or two after the design flood.

The new storm drains are meant to supplement the existing 2-year storm drain system in order to provide a combined capacity that is sufficient to convey the 10-year flood. The design of the new storm drains will require an analysis of both the new and the existing storm drain in order to make sure that the combined conveyance is adequate to convey the 10-year flood. As part of this ADMP, the watershed area and peak discharge for each new storm drain was determined. In the cases where these watersheds include existing storm drains, the required conveyance capacity of the new storm drains was determined by subtracting the capacity of the existing storm drain from the total 10-year flow in each of the sub-watersheds. The final design will require a detailed analysis of the watershed to verify the design flow for the new storm drain. And since the inlets on the existing storm drains are sized for the 2-year flood, the final design will also require a detailed inlet analysis to determine the size and location of new inlets to be added to the existing storm drains.

Major elements of the Cave Creek Floodplain plan are:

21st Avenue Storm Drain, Northern Avenue to Encanto Municipal Golf Course (\$50.8 M) – Appendix A

The 21st Avenue storm drain project includes a new 10-year storm drain in 21st Avenue as well as new laterals and catch basins for the existing 19th Avenue storm drain in order to increase its inlet capacity to a 10-year level of protection. Together, the new 21st Avenue storm drain combined with the existing 19th Avenue storm drain will provide a 10-year level of protection for the entire watershed area between I-17 and 17th Avenue from the Arizona Canal to Osborn Road. The 21st Avenue storm drain begins at 23rd Avenue and heads east in Northern Avenue and then runs south along 21st Avenue between Northern Avenue and Indian School Road. South of Indian School Road, the storm drain alignment shifts to 18th Avenue and runs south to Thomas Road where it discharges into the proposed Encanto Golf Course Detention Basin. The existing storm drain in 19th Avenue is used to collect runoff for the watershed between 21st Avenue and 17th Avenue from the Arizona Canal to the Grand Canal. However, the 19th Avenue storm drain is undersized for the 10-year event so a diversion pipe is included in the plan at Missouri Avenue which diverts flow from 19th Avenue to 21st Avenue. The new 21st Avenue storm drain is hydraulically connected to two City-owned offline detention basins. One is the Camelback Detention Basin located on 23rd Avenue, north of Camelback Road. The other is the proposed Turney Detention Basin, located at 20th Avenue, on the north side of the Grand Canal. The 21st Avenue storm drain outlets into the proposed Encanto Golf Course Detention Basin at Thomas Road.

Central Avenue Storm Drain, Northern Avenue to Bethany Home Road (\$8.1 M) – Appendix B

This is a new 2 ¼ mile long, 2-year storm drain that begins ¼ mile north of Northern Avenue and runs south in Central Avenue to Bethany Home Road; where it ties into the existing Central Avenue storm drain. Central Avenue is a tree lined street that has a rural feel which must be maintained so specially designed grated inlets will be located within the existing roadside swale, which lies between the roadway and the historic Murphy Bridle path. However, most of the runoff will be collected in new curb opening inlets located within the side streets along the east side of Central Avenue. These side streets have curb and gutter that provide a convenient place to collect the runoff. The proposed location of the storm drain is in the middle of the Central Avenue so that the pipe trench will have minimal impact to the roots of the trees that exist along Central.

3rd Avenue Storm Drain, Bethany Home Road to Encanto Municipal Golf Course (\$21.9 M) – Appendix C

The proposed 3rd Avenue storm drain begins at Bethany Home Road and outlets to the proposed Encanto Municipal Golf Course Detention Basin. The 3rd Avenue storm drain begins at Bethany Home Road and conveys storm water south to Thomas Road and then west to 7th Avenue. At 7th Avenue it turns south and then west in Cambridge Avenue where it outfalls in the proposed Encanto Golf Course Detention Basin. The purpose of this additional storm drain is to intercept storm water in excess of the 2-year storm that will bypass the Central Avenue storm drain and thereby increase the level of protection from 2-year to 10-year for the area between Central Avenue and 5th Avenue. The watershed area is from 5th Avenue to Central Avenue between Maryland Avenue to Thomas Road.

15th Avenue Storm Drain, Butler Drive to Palo Verde Golf Course (\$18.7 M) – Appendix D

The new 15th Avenue storm drain begins at Butler Drive and runs south in 15th Avenue, parallel to the existing 15th Avenue storm drain, to Maryland Avenue where it outfalls into the proposed Palo Verde Golf Course Detention Basin. Together the two pipes provide a 10-year level of protection for the watershed between 9th Avenue and 17th Avenue from Arizona Canal to Maryland Avenue. This storm drain project will also include additional inlets and laterals to be connected to the existing 7th Avenue storm drain in order to provide a 10-year level of protection for the combined watershed that lies between 17th Avenue and 5th Avenue from Arizona Canal to Maryland Avenue. A new junction structure at Maryland Avenue combines the new storm drain in 15th Avenue with the existing 42-inch lateral in Maryland Avenue. Just south of Maryland Avenue, a second new junction structure combines the two 15th Avenue storm drains and then splits the flow; maintaining a small low flow in the existing 15th Avenue storm drain while diverting the remainder of the storm water into the proposed Palo Verde Golf Course Detention Basin. The detention basin is emptied by flowing back through the same two 72-inch pipes that outlet into the basin; discharging back into the existing 15th Avenue storm drain at a maximum flow rate of about 50 cfs.

Storage at Palo Verde Golf Course (\$12.6 M) – Appendix E

The Palo Verde Golf Course is the proposed location for a new regional detention basin. The goal of the basin is to detain runoff from the contributing watershed between Central Avenue and 21st Avenue from the Arizona Canal to Maryland Avenue, with the basin sized for the 10-year runoff volume. The detention basin is designed to empty in 16 hours by discharging at metered rate (maximum rate 50 cfs) into the existing 15th Avenue storm drain. The Palo Verde Golf Course is ideally situated for a detention basin because it lies in the low flow path of the Old Cave Creek Floodplain. Therefore, surface flow naturally travels toward the detention basin. The golf course is proposed to be designed in such a way as to enhance the golf course by giving it a contoured appearance and making it more interesting to play. The parking lot, clubhouse, tee boxes and greens would be elevated above the high water elevation for the 10-year design

flood. The lake, driving range and non-play areas would provide the primary flood storage while the fairways would provide secondary storage. The fairways are purposely set six to eight feet above the bottom of the primary storage areas so that they would only be inundated during very large floods. The grading is designed so that stored floodwaters can migrate back to the lake and out to the 15th Avenue storm drain, without any low spots, avoiding any long term ponding in the golf course. This peak storage volume is 76 acre-feet (with 3 feet of freeboard), the peak storage depth is about 10 feet and the metered discharge rate is about 50cfs which flows back into the existing 15th Avenue storm drain.

Thomas Road Storm Drain, 24th Avenue to Encanto Golf Course (\$3.6 M) – Appendix F

The new Thomas Road storm drain is about ¾ mile long, which begins at 24th Avenue and conveys storm water east in Thomas Road to 19th Avenue where it discharges into the proposed Encanto Golf Course Detention Basin. The contributing watershed, for this storm drain, is between the I-17 freeway and 19th Avenue, from Thomas Road to Osborn Road. At 19th Avenue it combines in a junction structure with flow coming south in the existing 19th Avenue storm drain. A small portion, or low flows, of the combined flow continues south in the existing 19th Avenue storm drain; while larger flows will be diverted into the proposed Encanto Golf Course Detention basin.

15th Avenue Storm Drain, Camelback Road to Encanto Golf Course (\$23.9 M) – Appendix G

This new two mile long storm drain will run parallel to the existing 15th Avenue storm drain. The combination of the two storm drains will allow conveyance of the 10-year runoff from the contributing watershed which lies between 17th and 9th Avenue, from Thomas Road upstream to Maryland Avenue/Palo Verde Golf Course. The outfall for the 15th Avenue storm drain is the proposed Encanto Golf Course Detention Basin. The proposed storm drain begins upstream of the Grand Canal, just south of Camelback Road, and runs south parallel to the existing storm drain in 15th Avenue and outlets to a new junction structure located at Encanto Golf Course, about 900 feet south of Thomas Road. The junction structure has a small diameter pipe that diverts the low flow to the existing 15th Avenue storm drain while larger flows are diverted into the west side of the proposed Encanto Golf Course Detention Basin. The proposed 15th Avenue Underpass (See Appendix H) will act as an equalizer between the

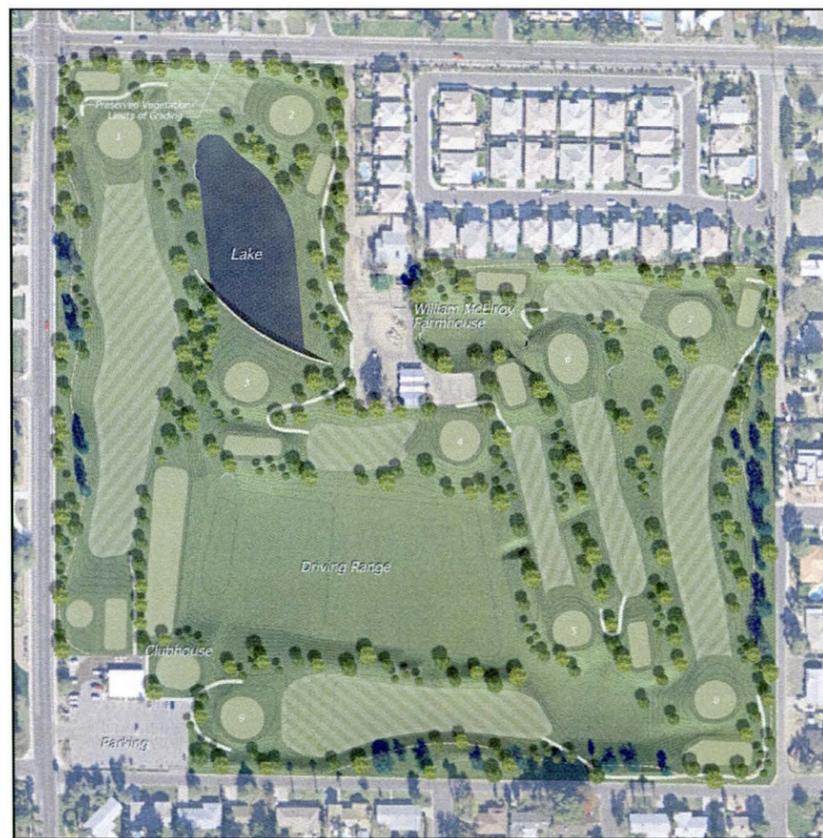


Figure 9 - Palo Verde Golf Course Concept



Figure 10 - Encanto Golf Course Concept

east and west sides of the proposed detention basin.

Storage at Encanto Municipal Golf Course (\$40.8 M) – Appendix H

The Encanto Municipal Golf Course is the proposed location for a new regional detention basin. The goal of the basin is to detain runoff from the contributing watershed, between Central Avenue and I-17 from the Arizona Canal to Thomas Road, with the basin sized for the 10-year flood. The Encanto Municipal Golf Course is ideally situated for a detention basin site because it lies in the low flow path of the Old Cave Creek Floodplain. Therefore, surface flow naturally travels toward the proposed detention basin. The golf course would be lowered 5 to 15 feet below street levels, creating contoured topography that will enhance the appearance of the course and make it more interesting to play. The parking lot, clubhouse, tee boxes and greens would be elevated so that they wouldn't be submerged during a flood event. The driving range and non-play areas would be the primary storage areas while the fairways would provide secondary storage. The fairways are purposely set five to seven feet above the bottom of the primary storage areas so that they will only be inundated during very large storm events. The grading is designed with positive slopes so that the stored floodwater can migrate back out to the existing storm drains, without any low spots, thereby avoiding any long term ponding in the golf course. The storage basin has a total storm water storage capacity of about 360 acre-feet between the east and west basin (i.e., east and west of 15th Avenue), a peak storage depth of about 12 feet (east basin) and 10 feet (west basin) and a total metered discharge rate of about 120cfs into the existing 19th Avenue, 15th Avenue, and 7th Avenue storm drains.

McDowell Road Storm Drain, 15th Avenue to I-10 Storm Water Interceptor at 9th Avenue (\$5.8 M) - Appendix I

This is a new ½ mile long, 10-year storm drain that begins at 15th Avenue, runs east in McDowell Road, south in 9th Avenue and connects to ADOT’s Storm Water Interceptor (SWI). This new storm drain diverts flow from the existing 15th Avenue storm drain to ADOT’s SWI. It is designed to collect the 10-year runoff from the contributing watershed between 16th Avenue and 7th Avenue, from the Encanto Municipal Golf Course to McDowell Road; including the outflow from the proposed Encanto Municipal Golf Course Detention Basin.

6.3 Downtown Plan

The recommended plan for the Downtown area is to increase the capacity of the existing 2-year storm drain system to provide a 10-year level of flood protection. It consists of seven new storm drains as well as the addition of new inlet capacity on several of the existing storm drains. The plan takes advantage of existing excess storm drain capacity, enabling the development of a 10-year storm drain system which only requires two new storm drains out to the Salt River. The excess capacity includes the City’s conveyance allocation in ADOT’s West Tunnel, which runs under Downtown along Central Avenue, as well as excess capacity in several of the existing City-owned storm drain storm drains that were cut off by the construction of I-10; or will be cut off by the new planned storm drain system for the Cave Creek Floodplain area.

The plan for the Downtown floodprone area includes the addition of inlet capacity to the City-owned storm drains that were cut off by the I-10 drainage system. These include large diameter pipes in 16th Street, 7th Street and 9th Avenue which have extra capacity downstream of I-10; providing an opportunity to capture more runoff in the Downtown floodprone area. In addition to the pipes cut off by the I-10 drainage system,

the recommended 10-year storm drain plan for Cave Creek Floodplain floodprone area (Section 6.2) will cut off flows in the existing 15th Avenue storm drain at McDowell Road and reduce the flows in the existing 19th Avenue storm drain. Therefore, new inlets will also be added to these storm drains in order to collect the 10-year flood in the area south of I-10.

The plan also includes taking advantage of the City’s allocation of conveyance in the West tunnel which is defined in an Intergovernmental Agreement (IGA) between the City and ADOT. This IGA allows new storm drain connections to ADOT’s West Tunnel at four locations; Fillmore Street, Grant Street, Tonto Street, and I-17. The Downtown floodprone area plan includes new storm drains that connect to the West tunnel at these locations.

As is the case with the Cave Creek Floodplain floodprone area, the new storm drains are meant to supplement the existing 2-year storm drain system in order to provide a combined capacity that is sufficient to convey the 10-year flood. The final design of the new storm drains will require an analysis of both the new and the existing storm drains in order to make sure that the combined conveyance is adequate to convey the 10-year flood. As part of this ADMP, the watershed area and peak discharge for each new storm drain was determined and in several cases these watersheds include existing storm drains. The required conveyance capacity of the new storm drains was determined by subtracting the capacity of the existing storm drain from the total 10-year flow in each of the sub-watersheds. The final design will require a detailed analysis of the watershed to verify the design flow for the new storm drains. And since the inlets on the existing storm drains are typically sized for the 2-year flood, the final design will also require a detailed inlet analysis to determine the size and location of new inlets to be added to the existing storm drains.

Major Elements of the Downtown floodprone plan are:

Add Inlets to 16th Street Storm Drain, I-10 to Railroad (\$1.3 M) – Appendix J

The depressed section of I-10 cut off the existing 16th Street storm drain at the freeway leaving it with substantial capacity downstream of I-10. This plan is to connect new laterals with storm drain inlets on the adjacent side streets to collect the 10-year flood and convey them in the existing 16th Street storm drain. The contributing watershed is the area west of I-10 over to 16th Street and from I-10 to the Union Pacific Railroad. The 16th Street storm drain ultimately discharges to the Salt River.

Fillmore Street (East) Storm Drain, 11th Street to West Tunnel (\$6.4 M) – Appendix K

The proposed Fillmore Street (East) storm drain has two segments. The first is a proposed storm drain in Fillmore Street that cuts off flows in the existing 4th Street storm drain and diverts them west to the ADOT tunnel at an existing 72-inch stub-out located at the intersection of Fillmore Street and 2nd Street. The second segment begins at the intersection of Portland Street and 11th Street and runs south in 11th Street to Fillmore Street. At Fillmore Street, it heads west until it connects to the existing 81-inch storm drain in 4th Street which is cut off by the first segment described above. The contributing watershed for the Fillmore Street (East) storm drain is from 2nd Street to 16th Street, between Fillmore Street and I-10 freeway. This project also includes a new 3rd Street lateral between Fillmore Street and Roosevelt Street as well as new inlets and laterals on the existing 7th Street storm drain between I-10 and Fillmore Street.

9th Street Storm Drain, Van Buren to Grant (\$7.0 M) – Appendix L

The proposed 9th Street storm drain project is a combination of new and existing storm drains that provide a 10-year level of protection for a fairly large portion of the downtown area. The contributing watershed is



Figure 11 - Recommended Plan for the Durango Curve and Downtown Area

between 2nd Street and 16th Street from approximately Fillmore Street to the Union Pacific Railroad. The 9th Street storm drain has three separate segments. The northern segment is a new ½ mile long, 10-year storm drain in 9th Street that begins at Taylor Street and runs south in 9th Street to Washington Street. At Washington Street it connects into the existing Washington Street storm drain which flows westerly. The second segment is a new 1¼-mile long, 10-year storm drain that begins at Washington Street where it connects to the upstream segment of the existing Washington Street storm drain. From Washington Street, it runs south to Southern Pacific Drive, west to 7th Street, south to Grant Street, and west to 3rd Street where it ties into the existing 3rd Street Storm Drain. The upstream segment of the existing 3rd Street storm drain is connected to the third segment of the 9th Street which is a new ¼ mile long 10-year storm drain that runs west in Grant Street to an existing 78-inch stub-out on ADOT's West Tunnel. In order to utilize extra capacity in the 5th and 13th Street storm drains, this project includes new storm drain inlets and laterals on the existing 5th Street and 13th Street storm drains between Fillmore Street and the Union Pacific Railroad.

Fillmore Street (West) Storm Drain, 3rd Avenue to 9th Avenue (\$3.9 M) – Appendix M

The proposed Fillmore Street (West) storm drain begins at 3rd Avenue and runs west to 9th Avenue where it ties into the existing 9th Avenue storm drain which ultimately drains to the Salt River. The contributing watershed is between 9th Avenue and 2nd Street between Van Buren Street and I-10. The proposed storm drain project includes new laterals in 3rd Avenue as well as new laterals on the side streets off 9th Avenue. The existing storm drain in 9th Avenue has been cut off by the ADOT drainage system providing substantial capacity south of I-10.

1st Avenue Storm Drain, Van Buren Street to West Tunnel at Tonto Street (\$4.5 M) – Appendix N

The new 1st Avenue storm drain begins at Van Buren Street and runs south to where 1st Avenue merges with Central Avenue. Between Jackson Street and Buchanan Street, the storm drain is aligned in the 1st Avenue frontage road, within the right-of-way, to avoid the very deep crossing of 1st Avenue under the railroad. At Madison Street, the alignment goes back to 1st Avenue. This storm drain discharges directly into ADOT's west tunnel. North of Jackson Street, the new storm drain will intercept an existing storm drain that runs east to west in the alley north of Jackson Street. At Tonto Street it connects to ADOT's west tunnel through an existing 72-inch stubout that is oriented to the east. This stubout will have to be reconstructed to be aligned to the west. The contributing watershed is between 1st Avenue and 2nd Street, from Buckeye Road to Van Buren Street.

Add Inlets to the 15th Avenue Storm Drain, I-10 to Van Buren (\$0.7 M) – Appendix O

This project is the installation of new inlets and storm drain laterals on the existing 15th Avenue storm drain. The proposed McDowell Road storm drain (See Appendix I) will divert the flow in the existing 15th Avenue storm drain, to ADOT's I-10 interceptor, resulting in excess storm drain capacity south of McDowell Road. The excess capacity is used to collect and convey the 10-year flood in a portion of the Downtown area, from the contributing watershed that is from 15th Avenue to 9th Avenue, from Van Buren Street to I-10.

Add Inlets to the 19th Avenue Storm Drain, I-10 to Van Buren (\$1.3 M) – Appendix P

The existing 19th Avenue storm drain will have substantial excess capacity due to the planned diversion of flows into the proposed Encanto Golf Course Detention Basin (See Appendix H). The low flow bypass and the outflow from the proposed detention basin only account for a small percentage of the existing 19th Avenue pipe capacity; freeing up considerable extra capacity for the area south of the Encanto Golf Course. Therefore, this project is the installation of new inlets and storm drain laterals on the 19th Avenue storm

drain to collect the runoff from the 10-year flood. The contributing watershed is between 19th Avenue and 15th Avenue, from Van Buren Street to Encanto Boulevard.

7th Street Storm Drain, Sherman Street to Salt River (\$6.5 M) – Appendix Q

This project is a new 1 ¼ mile long, 10-year storm drain in 7th Street from Sherman Street to the Salt River. The contributing watershed is between 7th Street and I-10, from I-17 to the Union Pacific Railroad. The project will also include upgrading the 12th Street and 16th Street existing storm drains by adding inlets and laterals to collect the runoff from the 10-year flood. The existing 12th and 16th Street storm drains have substantial excess capacity.

3rd Avenue Storm Drain, Buckeye Road to West Tunnel at I-17 (\$3.5 M) – Appendix R

This project is a new ¾-mile long, 10-year storm drain that begins at Buckeye Road and Harmon Parkway and runs south to ADOT's existing West Tunnel. The new 3rd Avenue storm drain intercepts and diverts flow to the south where it connects to an existing 48-inch stubout at ADOT's west tunnel. The contributing watershed is between Harmon Parkway and Central Avenue, from I-17 to Buckeye Road. This project also includes the installation of new inlets and storm drain laterals on the Central Avenue storm drain. The combined capacity of the existing Central Avenue storm drain and the new 3rd Avenue storm drain provides 10-year conveyance for the contributing watershed.

Jefferson Street Storm Drain System, 19th Avenue to 1st Avenue (\$6.6 M) – Appendix S

This project consists of three items: 1) upgrade the existing 19th Avenue Storm drain, 2) upgrade the existing 15th Avenue storm drain, and 3) extend the existing 7th Avenue storm drain north and add laterals. The contributing watershed is between 19th Avenue and 1st Avenue from Van Buren Street to the Union Pacific Railroad. The existing 19th Avenue storm drain has significant excess capacity due to the planned diversion of stormwater into the proposed Encanto Golf Course Detention Basin. This project includes the installation of new inlets and storm drain laterals on the 19th Avenue storm drain between Van Buren Street and the Union Pacific Railroad to collect the runoff from 10-year flood. This project also includes the installation of new inlets and storm drain laterals on the existing 9th Avenue and 15th Avenue storm drains, sized to collect the 10-year flow from the contributing watershed that lies between 15th Avenue and 8th Avenue, from Van Buren Street to the Union Pacific Railroad. Also included is an extension of the 7th Avenue storm drain from Madison Street to Van Buren Street with inlet capacity sized to provide a 10-year level of protection. The drainage area extends from 7th Avenue to 1st Avenue from Van Buren Street to the Union Pacific Railroad.

7th Avenue Storm Drain, Grant Street to Salt River (\$8.7 M) – Appendix T

This project is a new storm drain in 7th Avenue from Grant Street to the Salt River. The new storm drain parallels an existing storm drain and the combination of the two pipes has conveyance capacity for the 10-year runoff for the contributing watershed that lies between 7th Avenue and 3rd Avenue, from I-17 to the Union Pacific Railroad. There is a sag point in the profile of the proposed 78-inch storm drain at Station 133+50 that allows the storm drain to cross over the existing 66-inch sewer in Watkins Street. Crossing under the 66-inch sewer would result in a storm drain profile that is lower than the bottom of the Salt River. During final design of the storm drain, it shall be determined if a permanent pump will be required to drain the sag, or if the City would prefer to utilize portable pumps to drain the sag on an as needed basis. The cost for a permanent pump was not included in the cost estimate for the 7th Avenue Storm Drain.

Add Inlets to 11th Avenue and 15th Avenue Storm Drains (\$1.0 M) – Appendix U

This project is the installation of new inlets and laterals on the existing 11th Avenue and 15th Avenue storm drains. The existing storm drains will have excess capacity because of the existing and proposed upstream diversions. These storm drains will convey flows from north of the Union Pacific Railroad, but there will be left over capacity to convey the 10-year runoff from the watershed south of the Railroad. The contributing watershed is between 15th Avenue and 7th Avenue, from I-17 to the Railroad. The new laterals will be sized to have 10-year interception capacity.

6.4 Durango Curve Plan

The recommended plan for the Durango Curve area is a new 60-acre, floodwater detention facility designed to contain the 100-year flood. The drainage system is sized for the 100-year event to reduce and/or eliminate the Cave Creek Floodplain. It is located south of Buckeye Road, along the east side of I-17 and includes a 100-year stormwater collection system that runs up the I-17 Frontage Road to Van Buren Street. The collection system will prevent floodwater from spilling into the depressed section of I-17 which occurs between the Union Pacific Railroad and Van Buren Street. The basin is designed to accept the 100-year discharge from the Cave Creek Floodplain as well as the surface flow from the Downtown area. It is also designed to accept the discharge from ADOT’s existing 102-inch, I-17 storm drain.

To enhance the appeal of the regional detention facility, the 60-acre basin is designed to be a multi-use facility, able to accommodate a community park. The detention basin design provides enough space above the high water level to provide room for parking and restroom buildings. Hamilton Elementary School and a County housing project lie adjacent to the new basin, providing recreational opportunities for local

residents. The concept plan presented in Appendix V shows how the basin could be used as a park site.

Elements of the Durango Curve Plan are:

Regional Storage Basin at the Durango Curve (\$74.2 M) – Appendix V

A new 100-year stormwater storage basin located adjacent to and east of the I-17 freeway, south of Buckeye Road. The detention basin provides about 270 acre-feet of storage at a depth of about eight feet with a peak outlet discharge of about 500cfs. The basin will be drained to the Salt River through ADOT’s existing 102-inch storm drain. The peak stage is elevation 1049.9 (NAVD 29). By comparison, the lowest adjacent ground is the I-17 frontage road which is at an elevation of about 1052.0. Therefore, the basin’s freeboard is about two feet for the 100-year flood. The outlet pipe will drain the 100-year flood in about one day.

Primary inflow to the basin will come from a new ½ mile long, 100-year storm drain along the frontage road of the I-17 Freeway which will capture the Cave Creek Floodplain sheet flow before it spills into the Freeway. North of the Union Pacific Railroad, there will be a new interceptor channel located adjacent to the frontage road that will collect the sheet flow prior to spilling into the freeway. In addition, a new storm drain is proposed in Jackson Street to divert flows from the existing 19th Avenue storm drain and convey them to the new interceptor channel. These flows would be combined and conveyed south along the I-17 frontage road in a new double barrel box culvert that discharges to the proposed regional detention basin located south of Buckeye Road.

The secondary inflow will be ADOT’s existing 102-inch storm drain in I-17 which will be diverted into the basin through a new 12-foot x 4-foot box culvert. The plan also includes several new 10-year storm drain laterals on the north and east sides of the basin to collect and route the 10-year local runoff into the basin, precluding the erosion hazards associated with surface flow spilling over the basin slopes.



Figure 12 - Durango Curve Detention Basin Concept

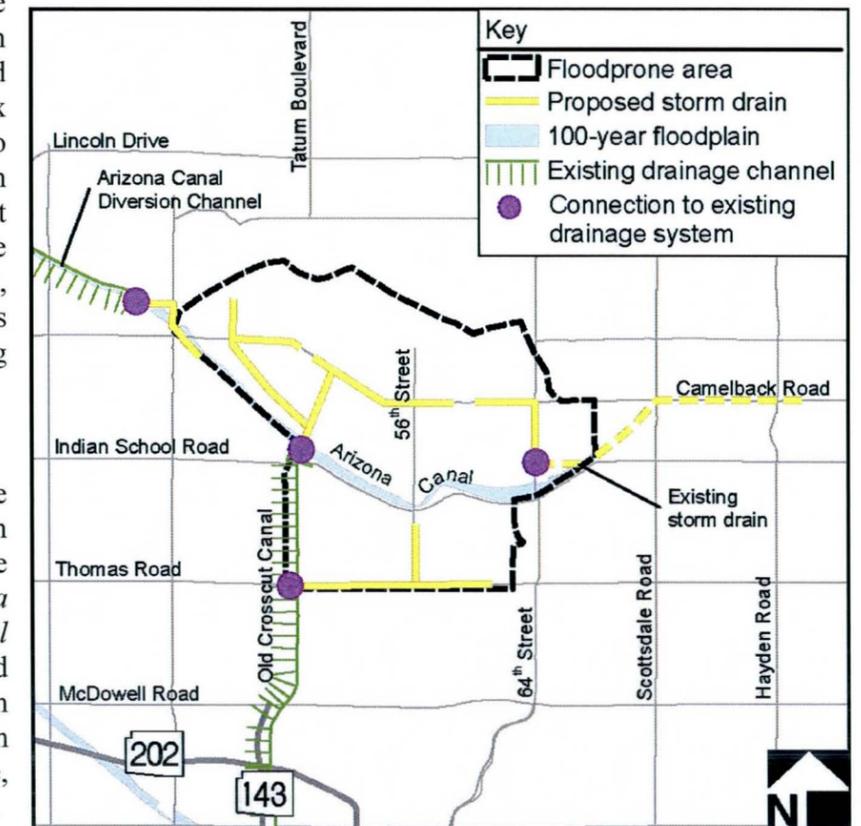


Figure 13 - Recommended Plan for the Arcadia Area

6.5 Arcadia Plan

The recommended plan for the Arcadia area is a new 10-year storm drain system as recommended by the Huitt-Zollar report entitled “Arcadia Area Drainage Study, Final Recommendations Report,” dated March 1997. It includes new storm drains along the Arizona Canal and in Camelback Road, Lafayette Drive, Arcadia Drive and Invergordon Road.

Downstream of the Arizona Canal, the recommended plan includes a new storm drain in Thomas Road, with a lateral in 56th Street, to collect and convey storm water that currently passes through the low lying neighborhoods west of the Arizona Country Club. This storm drain discharges to the existing Old Cross Cut Canal.

Elements of the Arcadia plan are:

Thomas Road Storm Drain, 60th Street to Old Cross Cut Canal (\$10.7 M) – Appendix W

This is a new 1 ¼ mile long, 10-year storm drain that begins at 61st Street and runs west in Thomas Road, discharging into the Old Cross Cut Canal. This project includes a lateral in 56th Street to capture runoff in the low point of the swale that comes out of the Arizona Country Club, north of Thomas Road. Storm water runs off the Papago Buttes and flows north to an existing swale within the Arizona Country Club. This swale flows westerly to the Old Cross Cut Canal. The contributing watershed is the area north of the buttes and south of the Arizona Canal, between 48th Street and approximately 60th Street.

Arcadia Area, 10-year Storm Drain System (\$24.7 M) – Appendix X

This is a new 10-year storm drain system as recommended by the Huitt-Zollar report entitled “Arcadia Area Drainage Study, Final Recommendations Report”, dated March 1997. It includes new storm drains along the Arizona Canal and in Camelback Road, Lafayette Drive, Arcadia Drive and Invergordon Road. The new storm drain system will discharge flows to the ACDC (115cfs), the Old Cross Cut Canal (681cfs) and to the existing storm drain in Lafayette Boulevard (125cfs). This plan was identified in the Huitt-Zollars report as Alternate number 2 and has been reviewed but not revised for inclusion into the Metro Phoenix ADMP. The cost estimate was updated to reflect 2008 costs.

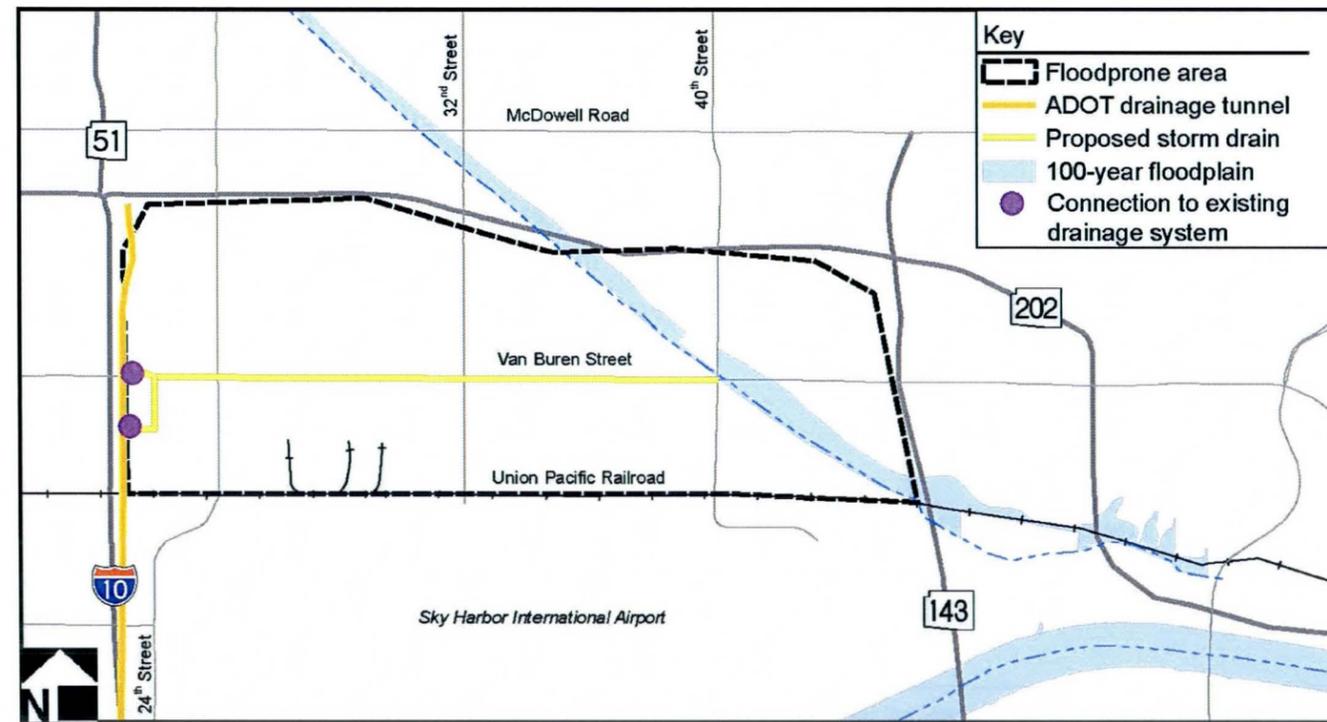


Figure 14 - Recommended Plan for the Airport North Area

6.6 Airport North Plan

The recommended plan for the Airport North area consists of a new 10-year storm drain in Van Buren Street, from I-10 to 40th Street, which collects local runoff and intercepts flow from the existing storm drains in 24th, 32nd, and 40th Streets. The new storm drain will discharge into ADOT’s existing East Tunnel drainage facility that runs along I-10. Capturing the flow from the existing upstream storm drains allows the City’s Aviation Department to use the residual capacity of these three existing storm drains to provide much needed storm drain conveyance for Sky Harbor International Airport.

Elements of the Airport North Plan are:

Van Buren Street Storm Drain, 40th Street to I-10 (\$19.3 M) - Appendix Y

This proposed storm drain cuts off the north-south flows in the existing 2-year storm drains and diverts that flow, plus the local 10-year runoff, west along Van Buren Street and discharges to ADOT’s East Tunnel. At 22nd Street, the new storm drain will require a special junction structure to split the flow into two storm drains to match the inlet capacity of the existing storm drain stub-outs on the East Tunnel. One connection will be at an existing stub-out in Adams Street, just south of Van Buren Street and the other will connect to an existing stub-out just north of Van Buren. The watershed for the local 10-year runoff is from 40th Street to I-10 and from Loop 202 to Van Buren Street.

This plan empties the existing storm drains in 24th Street, 32nd Street and 40th Street so that their capacity can be utilized to collect storm water runoff within Sky Harbor Airport. The City’s Aviation Department is currently investigating alternatives to improve drainage on the Airport property and they have expressed a desire to utilize these existing storm drains. Truncating the existing storm drains at Van Buren Street leaves them with considerable excess capacity through the Airport; providing a significant benefit to the City’s Aviation Department.

6.7 Grand Canal Floodplain Plan

The recommended plan for the Grand Canal Floodplain Floodprone area is for homeowners in the floodplain along the Grand Canal between 56th Street and I-17 to voluntarily participate in the District’s FPAP. The FPAP is intended for properties that are in a designated FEMA floodplain, and are subject to

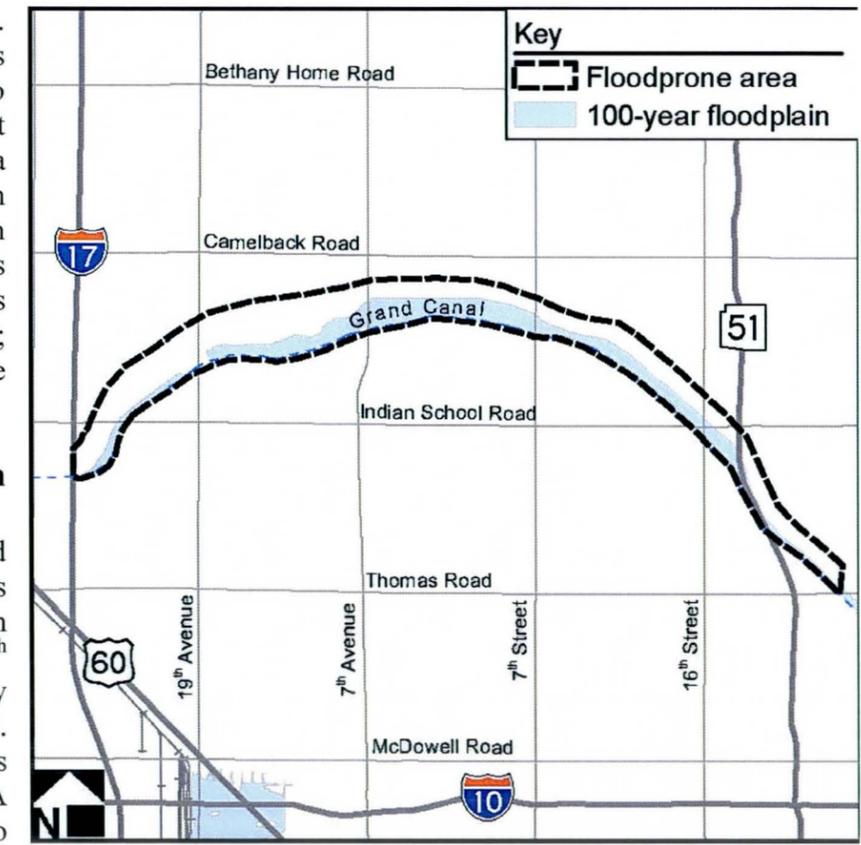


Figure 15 - Grand Canal Area/Floodplain

repetitive flooding. Details on the FPAP are available on the District’s web site. Homeowners can choose to apply to the FPAP but selection for assistance is not automatic. FPAP-eligible properties are compared to others in Maricopa County that submit to the program, and are prioritized through a ranking system. Because funding is limited, only the more severe flooding cases tend to be selected. Consequently, not all of the Grand Canal Floodplain properties may qualify for assistance.

It is further recommended that a future study be conducted along the Grand Canal Floodplain with expanded study limits that include the entire Grand Canal Floodplain from 56th Street to the beginning of the District’s Bethany Home Outfall Channel at 63rd Avenue. The purpose of this study will be to analyze structural solutions for the flooding problems along the entire reach of the Grand Canal Floodplain. These solutions could consider opportunities for utilizing the SRP canal right-of-way for new storm drain for smaller flows, floodproofing of homes along the Grand Canal. In addition, the elevation certificate program that the City has done for the majority of the homes in the Grand Canal Floodplain could be completed with this expanded study in order to better define the severity of the flood hazard and help to determine the depth of water for floodproofing options.

6.8 Implementation Plan

The recommended plan for the Metro Phoenix ADMP includes dozens of construction projects whose combined costs total approximately \$366 million (excludes FPAP cost). Hence, this is a long range plan that will be implemented over time as funding becomes available.

Projects recommended with the Metro Phoenix ADMP, including both structural and non-structural solutions, will be implemented on a cost share basis. Funding for most of the storm drain projects will be attained through a cost-share arrangement between two entities; the District and the City’s Street Transportation Department. The primary funding source for the City Street Transportation Department will likely come from future Storm Drain Bond Programs. However, four of the projects may have several other potential funding partners. These include the detention basins at Palo Verde Golf Course and Encanto Golf Course where the City’s Parks and Recreation Department may help fund the construction. Another is the Durango Curve Detention Basin which also may have a number of potential funding partners including: ADOT due to the prospect for reduced flooding of I-17, the City’s Water Services Department because of the protection it would provide to the 27th Avenue Waste Water Treatment Plant, and the City’s Parks and Recreation Department because of the potential for the basin to become a community park. In addition to these projects, the City’s Aviation Department may help fund the construction of the Van Buren Storm Drain because of the benefits that it provides for Sky Harbor Airport.

Implementation of the drainage improvements identified in the recommended plan must consider the interrelation of the various elements of the plan and their dependence on one another. For example, in order to provide an outfall for the planned storm drain system in the Cave Creek Floodplain area, the detention basins at Palo Verde Golf Course and Encanto Golf Course must be constructed in advance of the new upstream storm drain pipes. Likewise, the Durango Curve Detention Basin is sized based on the assumption that the upstream, 10-year storm drain systems are in place. Therefore, the Durango Curve Basin can not provide its planned 100-year level of flood protection without the construction of the upstream storm drains in both the Downtown area and the Cave Creek Floodplain area. Other factors, such as the history of flooding issues and the availability of funding also play a role in determining the implementation of the plan. For instance, the Downtown area is first on the sequence of construction presented in Table 5 because the City already has storm drain bond funds available for Downtown drainage improvements.

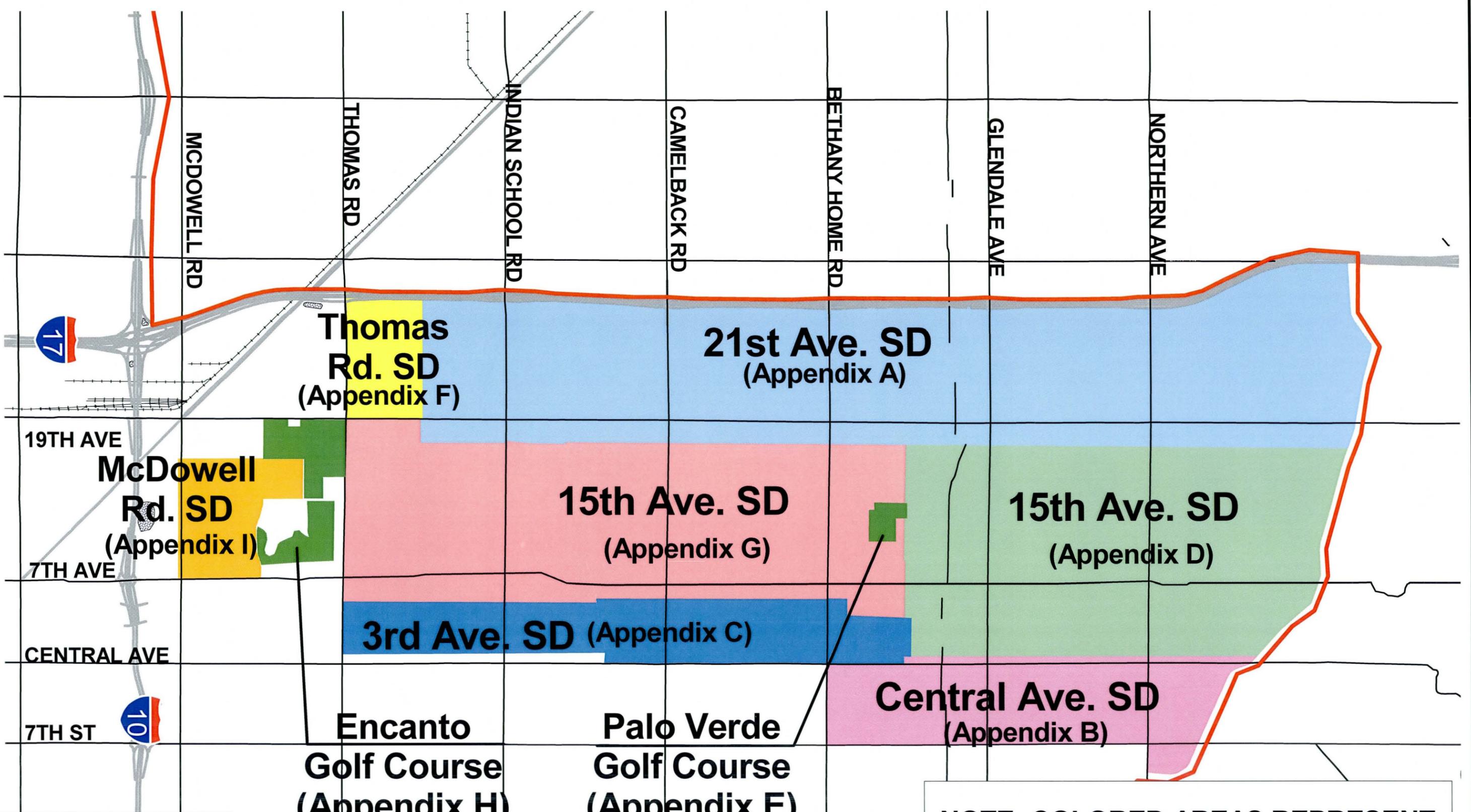
Table 5 was developed by consulting with the City’s Storm Water Management staff. Depending on funding, most of the 15 elements will be constructed in multiple phases. For example, the City has already identified at least two storm drain projects in the Downtown area that will be designed in the 2008/2009 fiscal year. These projects, however, only represent about one-half of the storm drain construction that is planned as part of element number one in Table 5. The exact number of phases has not been identified, but it will probably require another four to six projects (or phases) to complete the Downtown storm drains located north of the railroad tracks. It is likely that most of the other elements identified in Table 5 will also be constructed in a similar phased fashion, resulting in numerous individual construction projects. Table 5 does not present the FPAP options which would also be implemented on a cost share basis with the City as funds are available.

The sequence of construction defined in Table 5 may change over time if priorities change. For example, the Durango Curve Detention Basin is number 14 on the list because, as described above, it is dependent on the installation of the upstream 10-year storm drain systems in order to provide its planned, 100-year level of protection. However, even if the upstream storm drains are not in place, it can still provide significant flood protection and could benefit a number of entities. These benefits include significantly reducing the flood potential of I-17, eliminating or significantly reducing the floodplain both upstream and downstream of I-17, providing flood protection for the 27th Avenue Wastewater Treatment plant, and providing enough space for a community park. If, in the future, these benefits prompt funding for the Durango Curve Basin, it could be constructed in advance of the upstream improvements, and even though it would not have enough capacity to contain the 100-year flood, it would still represent a significant improvement over the existing flooding conditions; controlling floodwaters for most major storm events.

Table 5 - Planned Sequence of Construction

Plan Element	Estimated Cost (millions)
1. Downtown Storm Drains (north of the Railroad) ✓	\$31.6
2. Arcadia Area Storm Drains ✓	\$24.7
3. Central Avenue Storm Drain (Bethany Home Rd. to Arizona Canal) -	\$8.1
4. Thomas Rd. Storm Drain (Old Cross Canal to 60 th St.) ✓	\$10.7
5. Palo Verde Golf Course Storage Basin (includes downstream 15 th Avenue storm drain laterals) ✓	\$12.6
6. 15 th Avenue Storm Drain (Palo Verde Golf Course to Butler Drive) ✓	\$18.7
7. Encanto Golf Course Storage Basin -	\$40.8
8. 21st Avenue Storm Drain (Encanto Golf Course to Northern Avenue) ✓	\$50.8
9. 15 th Avenue Storm Drain (Encanto Golf Course to Grand Canal) ✓	\$23.9
10. 3 rd Avenue Storm Drain (Encanto Golf Course to Bethany Home Rd.) ✓	\$21.9
11. Thomas Road Storm Drain (Encanto Golf Course to 24 th Avenue)	\$3.6
12. McDowell Road Storm Drain (ADOT SWI to 15 th Avenue)	\$5.8
13. Downtown Storm Drains (south of the Railroad)	\$19.7
14. Durango Curve Detention Basin and Collection System	\$74.1
15. Van Buren Street Storm Drain (I-10 to 40 th Street)	\$19.3
TOTAL	\$366.3

CAVE CREEK



Thomas Rd. SD
(Appendix F)

21st Ave. SD
(Appendix A)

McDowell Rd. SD
(Appendix I)

15th Ave. SD
(Appendix G)

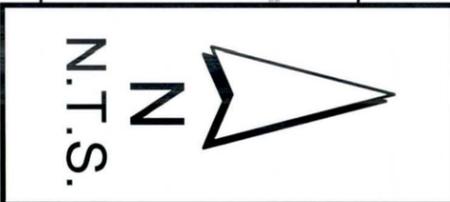
15th Ave. SD
(Appendix D)

3rd Ave. SD (Appendix C)

Encanto Golf Course
(Appendix H)

Palo Verde Golf Course
(Appendix E)

Central Ave. SD
(Appendix B)



NOTE: COLORED AREAS REPRESENT WATERSHED BOUNDARIES FOR EACH PROJECT IDENTIFIED THEREON

APPENDIX A
21ST AVENUE STORM DRAIN
Northern Avenue to Encanto Golf Course

21st Avenue Storm Drain, Northern Avenue to Encanto Municipal Golf Course – 10-year Storm Drain

The 21st Avenue storm drain project includes a new 10-year storm drain in 21st Avenue as well as new laterals and catch basins for the existing 19th Avenue storm drain in order to increase its inlet capacity to a 10-year level of protection. Together, the new 21st Avenue storm drain combined with the existing 19th Avenue storm drain will provide a 10-year level of protection for the entire watershed area between I-17 and 17th Avenue from the Arizona Canal to Osborn Road. The new 21st Avenue storm drain runs along 21st Avenue between Northern Avenue and Indian School Road. South of Indian School Road, the storm drain alignment shifts to 18th Avenue and runs south to Thomas Road where it discharges into the proposed Encanto Golf Course Detention Basin. The existing storm drain in 19th Avenue is used to collect runoff for the watershed between 21st Avenue and 17th Avenue from the Arizona Canal to the Grand Canal. However, the 19th Avenue storm drain is undersized for the 10-year event so a diversion pipe is included in the plan at Missouri Avenue which diverts flow from 19th Avenue to 21st Avenue. The 21st Avenue storm drain outlets into the proposed Encanto Golf Course Detention Basin at Thomas Road where it ultimately drains to the Salt River through the 15th Avenue and 19th Avenue storm drains.

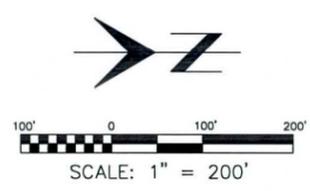
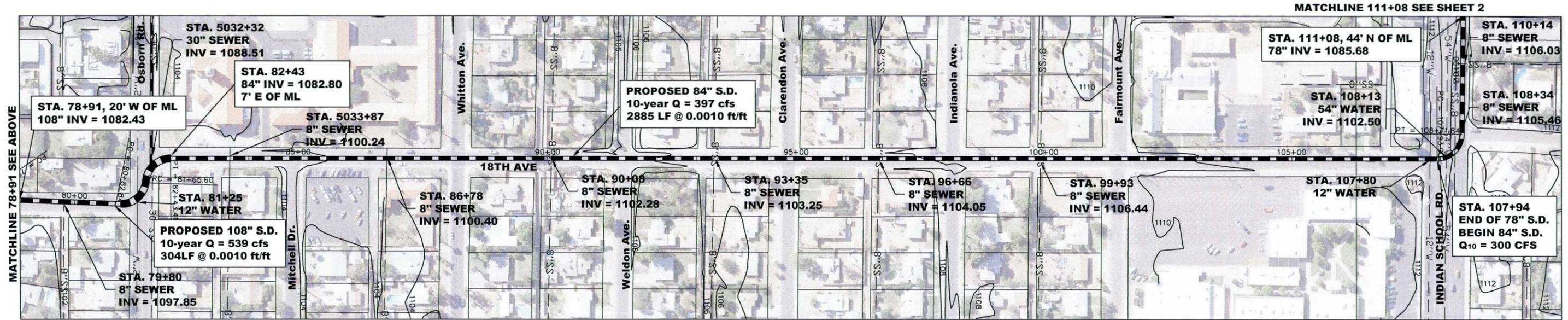


At the upstream end of the new 21st avenue storm drain, there is an existing 66-inch storm drain in 23rd Avenue that terminates at Northern Avenue. This pipe currently has a temporary drain into a small diameter pipe which discharges to the I-17 storm water system. The new 21st Avenue storm drain will remove this temporary connection to the I-17 storm water system and provide the permanent connection to the proposed Encanto Golf Course Detention Basin. The 21st Avenue storm drain has been designed to take advantage of the storage capacity of the existing 24th Avenue/Camelback Detention Basin and the future Turney Detention Basin.

Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The proposed Encanto Golf Course Detention Basin needs to be constructed prior to the storm drain to provide an outlet.
- The 24th Avenue/Camelback Detention Basin will function as an offline basin, only receiving storm water when the depth of flow in the 21st Avenue storm drain rises above 1.5 feet; thereby allowing low flows to pass without inundating the basin. Once the pipe depth rises above 1.5 feet, flow is diverted to the detention basin through a new storm drain in Medlock Drive.
- The future Turney Basin will also function as an offline basin, only receiving storm water once the capacity of the downstream 66-inch storm drain is exceeded. Flows in excess of the 66-inch pipe will “bubble up” in the junction structure that lies within the detention basin.
- The Turney Basin was assumed to have a volume of approximately 40 acre-feet of storage.
- The final designer will need to verify the as-built, stage-discharge relationship for both the existing 24th Avenue/Camelback Basin and the future Turney Basin and revise the reservoir data within the HEC-1 model, as necessary, to make sure the storm drain system can convey the 10-year flood.
- Due to the shape of the basin, a 24” pipe should be added on the western side to help drain the basin.
- The flow in the 19th Avenue storm drain has to be diverted to the 21st Avenue storm drain at Missouri Avenue otherwise the 19th Avenue storm drain will be exceeded downstream.
- There is a difficult junction structure to construct at Indian School and 19th Avenue. The existing sanitary sewers will need to be avoided. The existing 19th Avenue storm drain will also need to maintain existing capacity to the south.
- The final designer shall prepare hydraulic grade line calculations taking into account head losses at the junction structures, to verify pipe sizes.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

21st Avenue Storm Drain		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	72" SD in Northern Ave to 21st Ave south to Orangewood STA. 313+43 TO STA. 353+01	LF	\$869.15	3958	\$ 3,440,099
2	78" SD in 21st Ave, Glendale to Orangewood STA. 286+94 TO STA. 313+43	LF	\$931.64	2649	\$ 2,467,908
3	84" SD in 21st Ave, Maryland to Glendale STA. 261+43 TO STA. 286+94	LF	\$994.11	2551	\$ 2,535,976
4	90" SD in 21st Ave, Bethany Home to Maryland STA. 234+44 TO STA. 261+43	LF	\$1,056.60	2699	\$ 2,851,757
5	96" SD in 21st Ave, Missouri to Bethany Home STA. 207+43 TO STA. 234+44	LF	\$1,119.08	2701	\$ 3,022,647
6	102" SD in 21st Ave., Medlock to Missouri STA. 188+05 TO STA. 207+43	LF	\$1,195.49	1938	\$ 2,316,862
7	66" SD in 21st Ave, Hazelwood to Medlock STA. 164+64 TO STA. 188+05	LF	\$806.66	2341	\$ 1,888,400
8	84" SD in 21st Ave, Turney to Hazelwood STA. 148+87 TO STA. 164+64	LF	\$994.11	1577	\$ 1,567,713
9	90" SD in Turney Ave., Basin to 21st Ave STA. 140+38 TO STA. 148+87	LF	\$1,056.60	849	\$ 897,051
10	66" SD in 20th Ave., Indian School to Basin STA. 114+64 TO STA. 140+38	LF	\$806.66	2574	\$ 2,076,353
11	78" SD in Indian School, 18th to 19th Ave. STA. 107+94 TO STA. 114+64	LF	\$931.64	670	\$ 624,197
12	84" SD in 18th Ave., Osborn to Indian School STA. 82+43 TO STA. 107+94	LF	\$994.11	2551	\$ 2,535,976
13	108" SD in 18th Ave., Thomas to Osborn STA. 54+65 TO STA. 82+43	LF	\$1,731.26	2778	\$ 4,809,435
14	12'x4' CBC, Encanto Golf Course to Thomas STA. 50+00 TO STA. 54+65	LF	\$1,501.58	365	\$ 548,076
15	78" SD Lateral In Medlock Dr.	LF	\$931.64	1000	\$ 931,638
16	72" SD Lateral In Osborn Rd., 24th Ave to 18th Ave	LF	\$869.15	3900	\$ 3,389,688
17	48" SD Lateral in Orangewood Rd., 23rd Dr. to 21st Ave	LF	\$617.20	1300	\$ 802,359
18	48" SD Lateral in Glendale Ave., 23rd Dr to 21st Ave	LF	\$617.20	1460	\$ 901,110
19	48" SD Lateral in Citrus Way, 23rd Dr. to 21st Ave	LF	\$617.20	1330	\$ 820,875
20	36" SD Lateral in Bethany Home Rd., 23rd Dr to 21st Ave	LF	\$479.85	1330	\$ 638,201
21	54" SD Lateral in Campbell Ave., 23rd Dr to 21st Ave	LF	\$680.99	1300	\$ 885,293
22	72" SD lateral in Missouri to connect 19th Ave SD to 21st Ave. SD	LF	\$869.15	1300	\$ 1,129,896
23	Camelback Detention Basin Junction Structure	EA	\$50,000.00	1	\$ 50,000
24	Turney Detention Basin Junction Structure	EA	\$50,000.00	1	\$ 50,000
25	Missouri Avenue Junction Structure	EA	\$50,000.00	1	\$ 50,000
26	Indian School Road Junction Structure	EA	\$50,000.00	1	\$ 50,000
27	19th Avenue SD Upgrade from 2-yr to 10-yr (Add Inlets)	LM	\$200,000.00	5.2	\$ 1,040,000
Sub Total					\$ 42,321,512
Contingencies (20%)					\$ 8,464,302
TOTAL					\$ 50,785,800



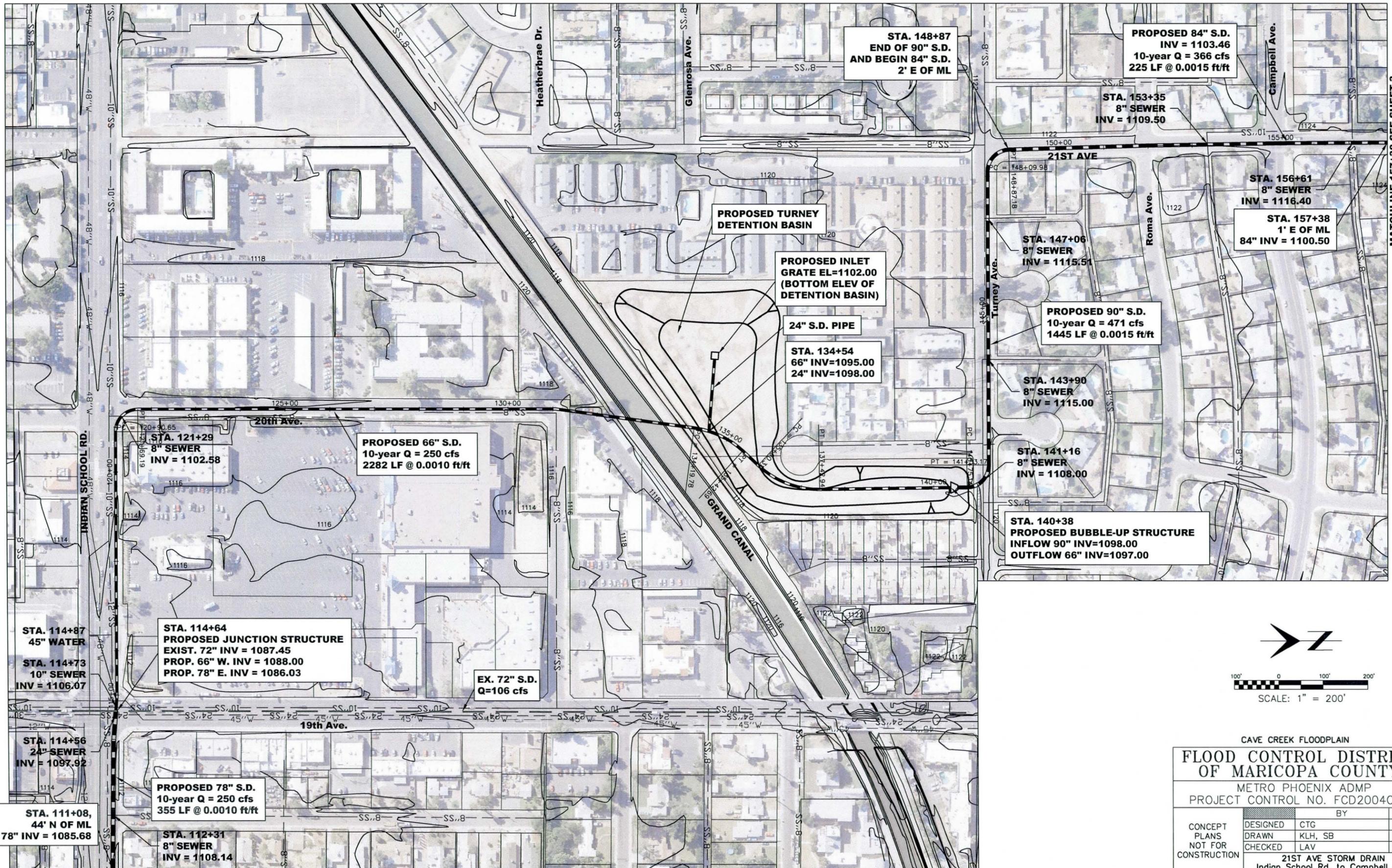
CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

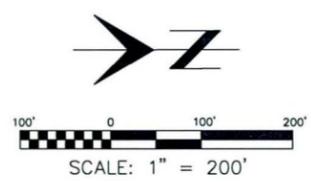
METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
21ST AVE STORM DRAIN Thomas Rd. to Indian School Rd.			
	PLAN SHEET		SHEET OF
	STA. 50+00 to STA. 111+08		1 6

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



MATCHLINE 157+38 SEE SHEET 3



CAVE CREEK FLOODPLAIN
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
 METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

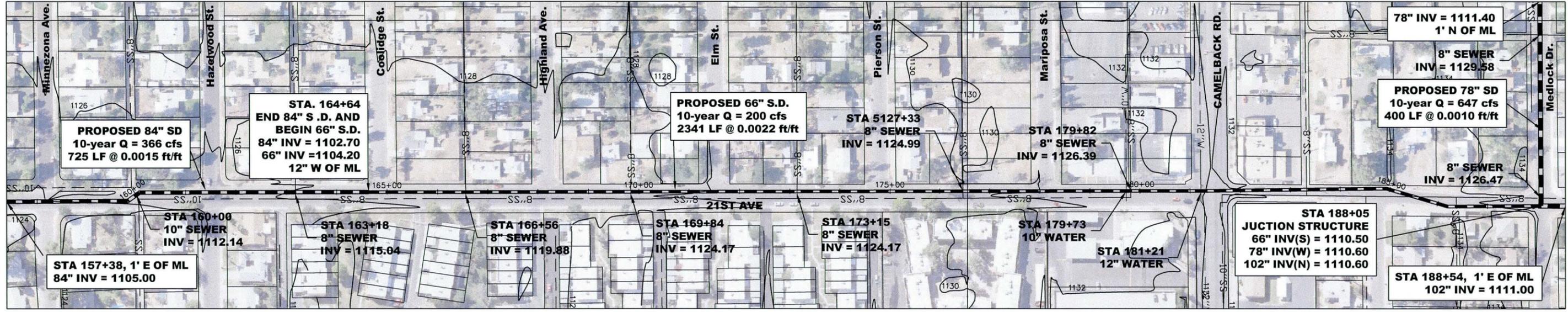
	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

21ST AVE STORM DRAIN
 Indian School Rd. to Campbell Ave.

eec	PLAN SHEET	SHEET OF
	STA. 111+08 to STA. 157+38	2 6

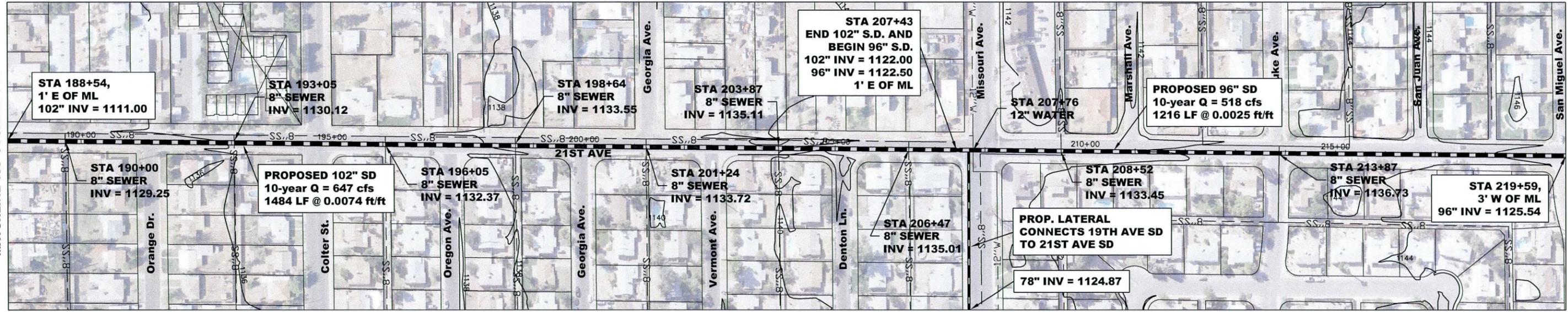
MATCHLINE 111+08 SEE SHEET 1
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 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 157+38 SEE SHEET 2



MATCHLINE 188+54 SEE BELOW

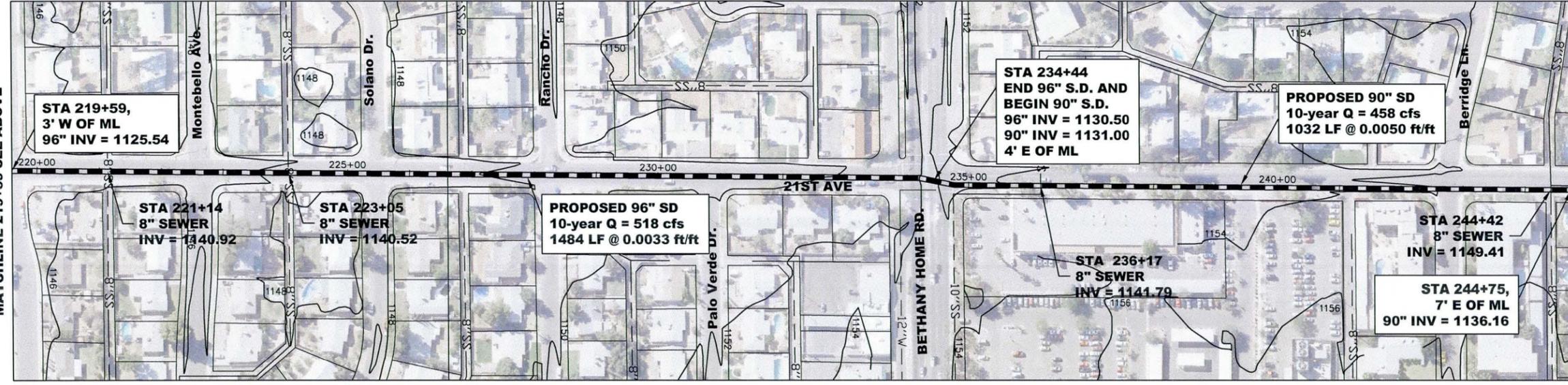
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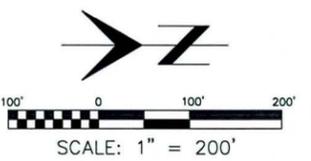
MATCHLINE 219+59 SEE BELOW

MATCHLINE SEE SHEET 4

MATCHLINE 219+59 SEE ABOVE



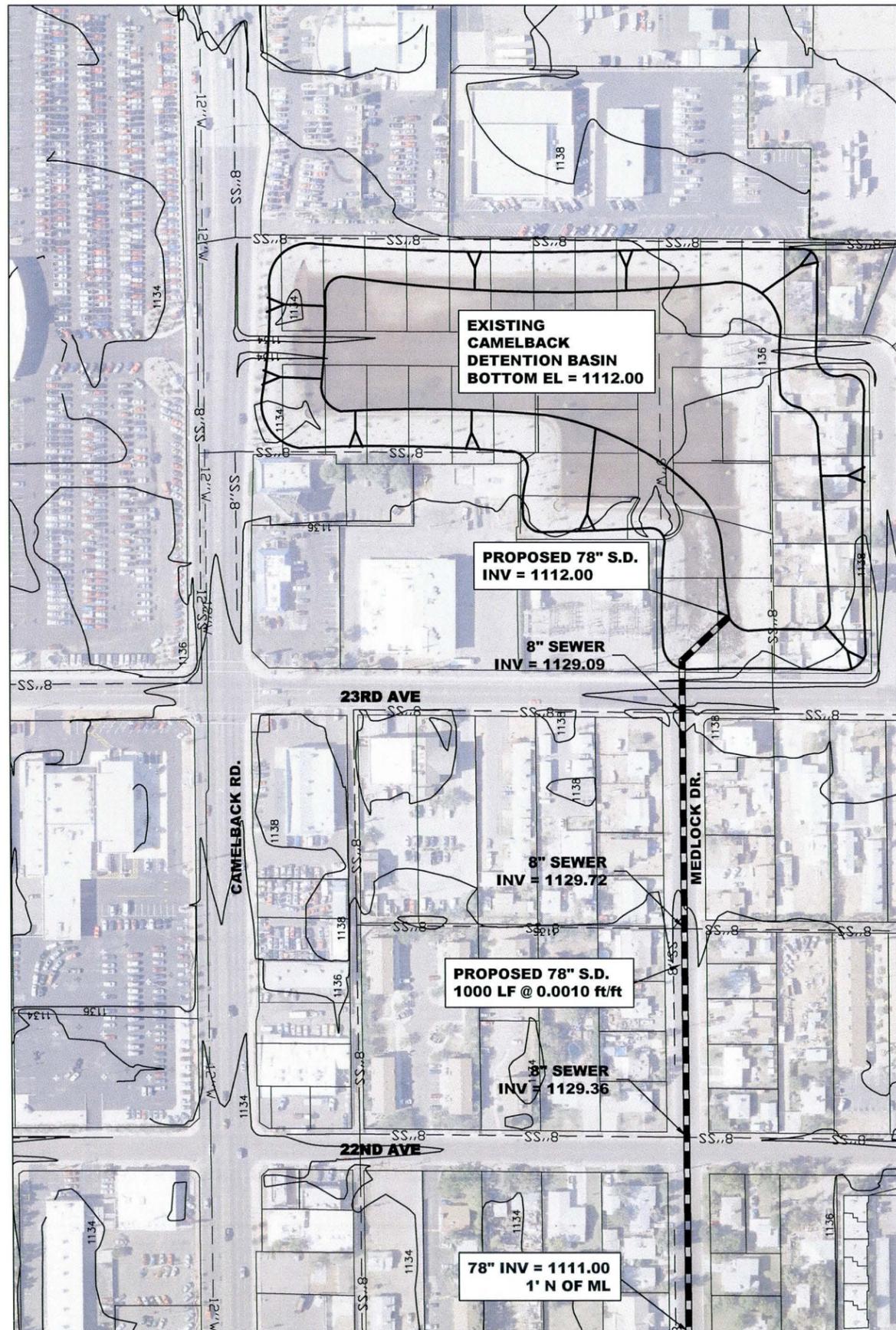
MATCHLINE 244+75 SEE SHEET 5



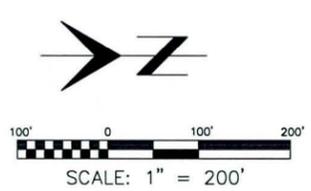
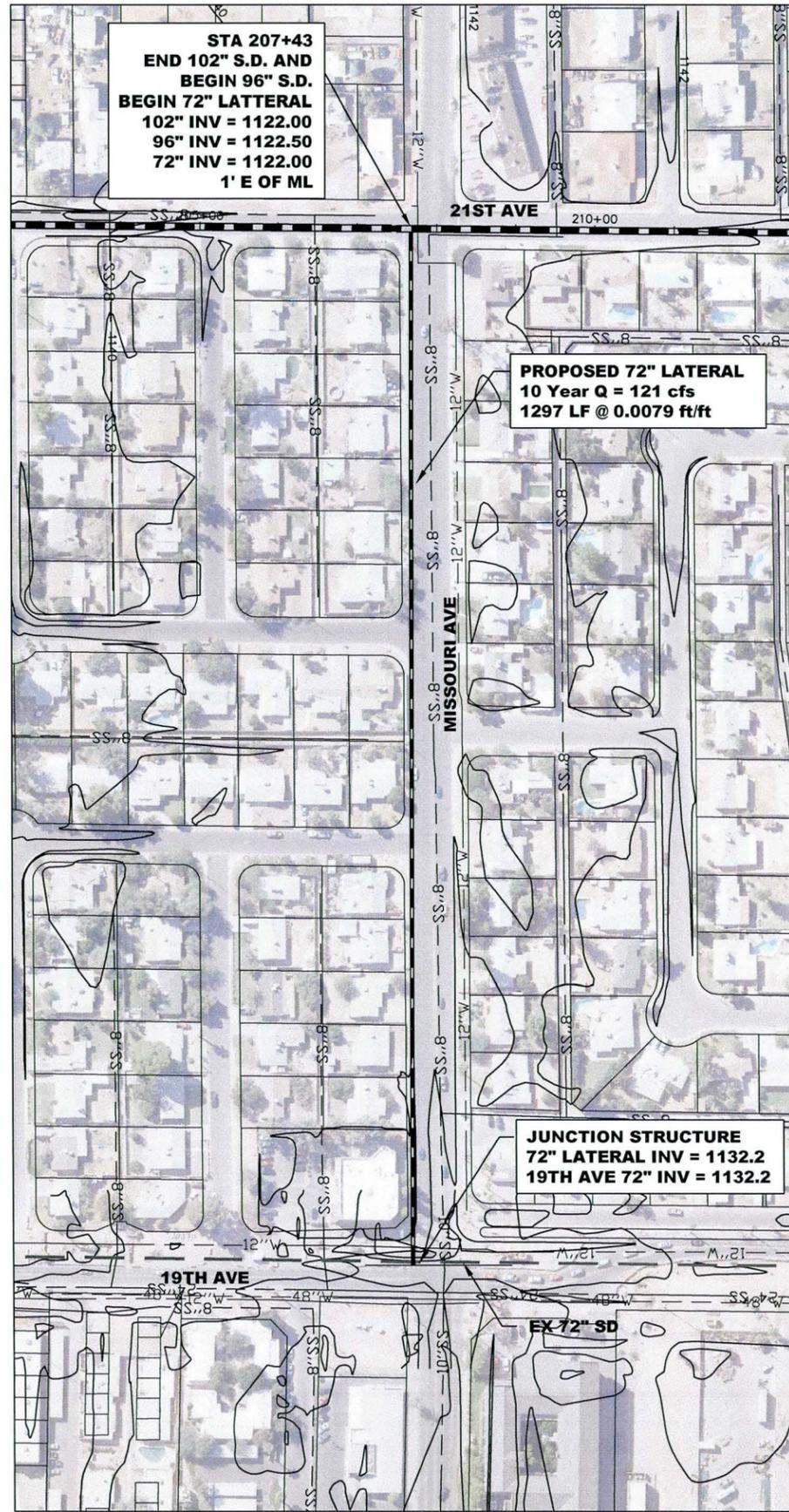
CAVE CREEK FLOODPLAIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040		BY	DATE
DESIGNED	CTG		09/08
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
21ST AVE STORM DRAIN Campbell Ave. to Bethany Home Rd.			
PLAN SHEET STA. 157+38 to STA. 244+75		SHEET OF	
eec		3	6

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



MATCHLINE SEESHEET 3



CAVE CREEK FLOODPLAIN

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

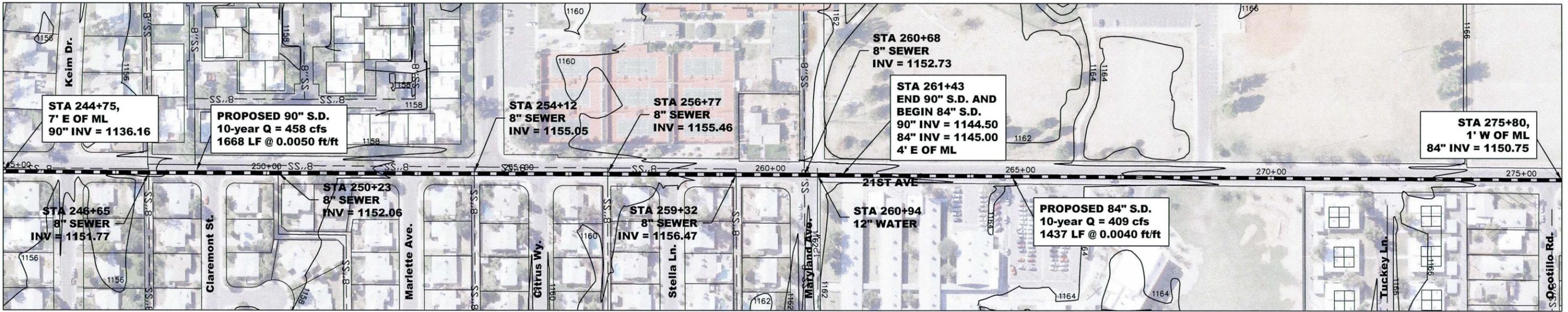
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	DATE
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08

21ST AVE STORM DRAIN
Campbell Ave. to Bethany Home Rd.

eec	PLAN SHEET	SHEET OF
	STA to STA	4 6

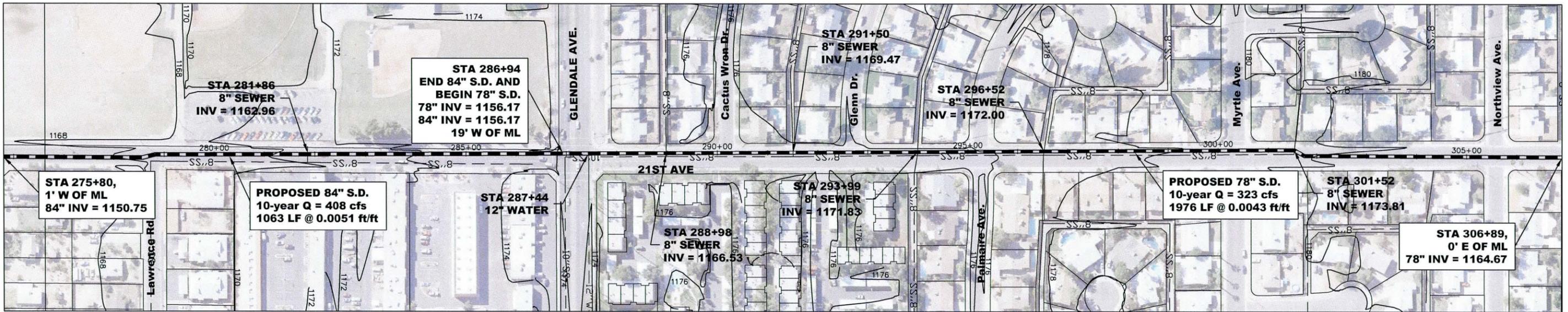
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 244+75 SEE SHEET 3

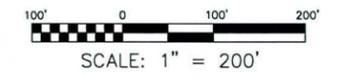


MATCHLINE 275+80 SEE BELOW

MATCHLINE 275+80 SEE ABOVE



MATCHLINE 306+89 SEE SHEET 6



CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

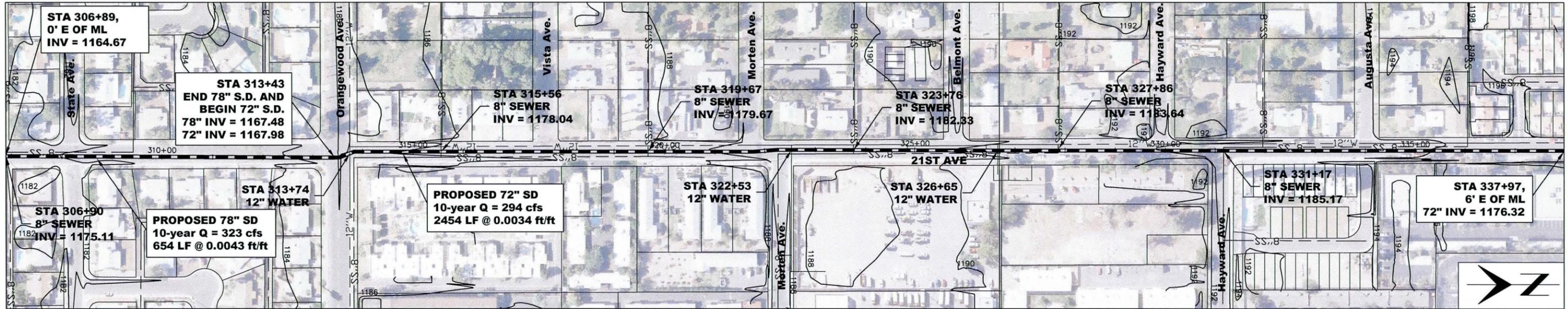
CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08

21ST AVE STORM DRAIN
Bethany Home Rd. to Glendale Ave.

eec	PLAN SHEET	SHEET OF
	STA. 244+75 to STA. 306+89	5 6

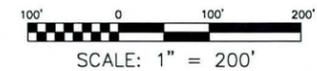
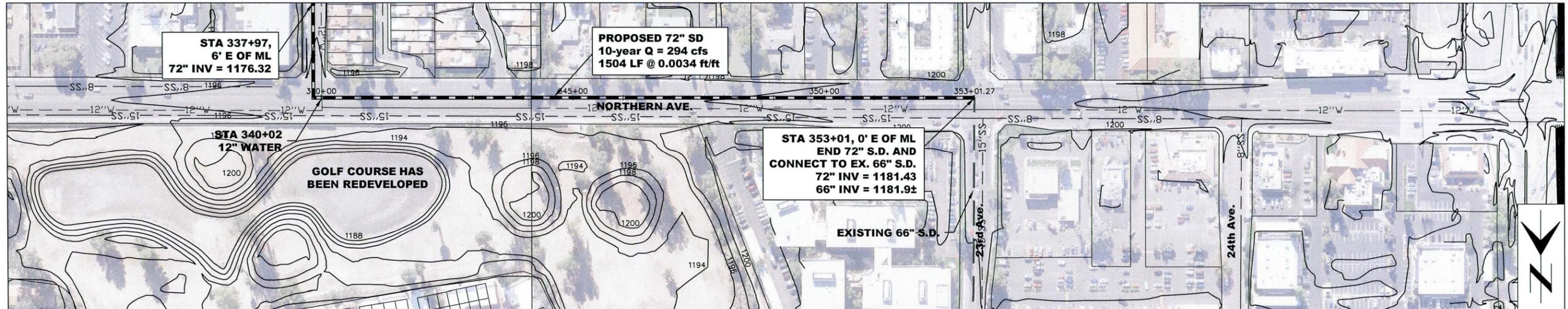
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 306+89 SEE SHEET 5



MATCHLINE 337+97 SEE BELOW

MATCHLINE 337+97 SEE ABOVE



CAVE CREEK FLOODPLAIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040			
	BY	DATE	
CONCEPT	DESIGNED	CTG	09/08
PLANS	DRAWN	KLH, SB	09/08
NOT FOR CONSTRUCTION	CHECKED	LAV	09/08
21ST AVE STORM DRAIN Glendale Ave. to Northern Ave.			
PLAN SHEET		SHEET OF	
STA. 306+89 to STA. 353+01		6 6	

APPENDIX B
CENTRAL AVENUE STORM DRAIN
Northern Avenue to Bethany Home Road

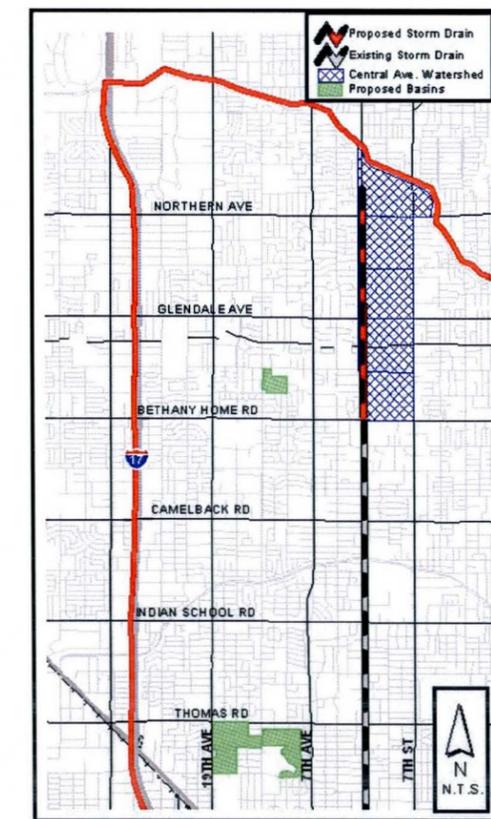
Central Avenue Storm Drain, Northern Avenue to Bethany Home Road – 2-year Storm Drain

The watershed boundary is from 7th Street to Central Avenue from the Arizona Canal to Bethany Home Road. The new Central Avenue storm drain is located between Griswold and Bethany Home Road and is designed to collect the 2-year runoff flowing from east to west across Central Avenue. This new storm drain will tie into the existing Central Avenue storm drain at Bethany Home Road.

The existing storm drain in Central Avenue ends at Bethany Home Road but was designed with enough capacity to be extended to Northern Avenue. This proposed storm drain will extend the existing storm drain from Bethany Home Road to Griswold Road just north of Northern Avenue. The existing Central Avenue storm drain continues south until it reaches the I-10 where it outlets to ADOT’s I-10 North Drainage Tunnel.

The Murphy Bridle path is an important cultural aspect of Central Avenue. This project shall be designed to preserve the Bridle Path and cause as little impact as possible. This will include specially designed inlets along Central Avenue to maintain the landscape character of the path.

This recommended plan for Central Avenue is in agreement with the Scenic Quality Assessment and the theme developed in response to the existing historical landscape character of Central Avenue, and the understood sensitivity to any aesthetic changes to Central Avenue and the Bridle Path. The planned storm drain improvements require a minimal degree of aesthetic alterations as illustrated in the photo simulation on this page.



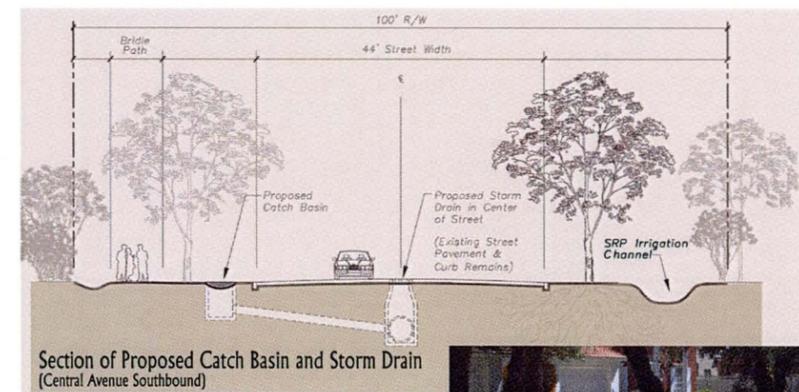
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 2-year runoff is collected for the entire watershed.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- Preservation of the Murphy Bridle path is imperative. The scenic integrity must be maintained. Specially designed inlets should blend with the natural path as shown herein.
- The storm drain alignment is down the center of the road to protect the trees. All trees need to be preserved along Central Avenue if possible.
- There will be inlets in the side streets to capture the flows from the east.
- There is small swale on the east side to capture flow and direct it into the proposed half grate inlets.
- This is a 2-year conveyance system that matches the design of the existing Central Avenue stub-out at Bethany Home Road.
- This section of storm drain has been previously designed for the City of Phoenix (Project No. ST-846071) from Glendale Road to the Arizona Canal. The storm drain

was never built due to public concern over impacts to the historic Central Avenue streetscape.

- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Central Avenue Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	36" SD in Central Ave, Griswold Rd. to Northern Ave. STA. 1104+50 TO STA. 1118+36	LF	\$479.85	1386	\$ 665,072
2	42" SD in Central Ave, Northern to Glendale STA. 1051+67 TO STA. 1104+50	LF	\$555.02	5283	\$ 2,932,161
3	48" SD in Central Ave, Glendale to Bethany Home STA. 1000+00 TO STA. 1051+67	LF	\$617.20	5167	\$ 3,189,067
Sub Total					\$ 6,786,300
Contingencies (20%)					\$ 1,357,260
TOTAL					\$ 8,143,600



Section of Proposed Catch Basin and Storm Drain (Central Avenue Southbound)



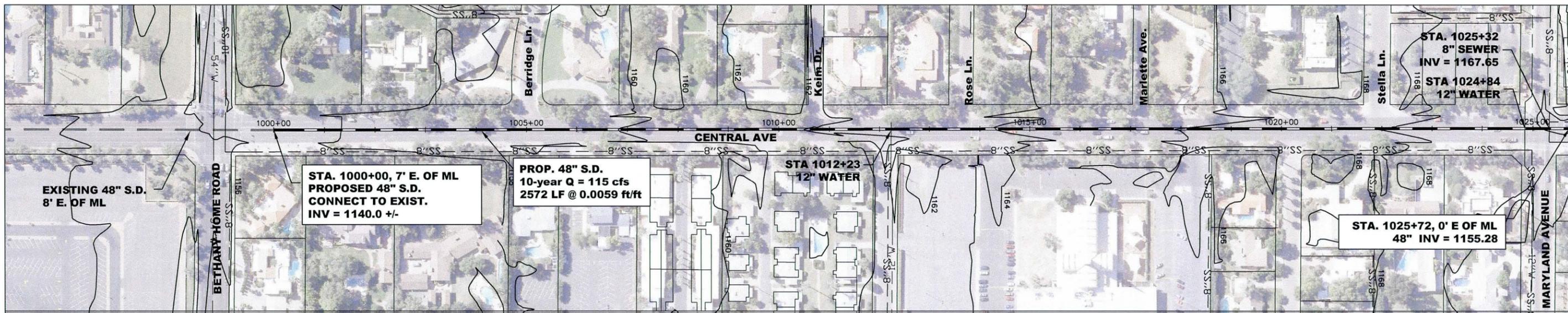
Simulation of Catch Basin - East Side Looking North



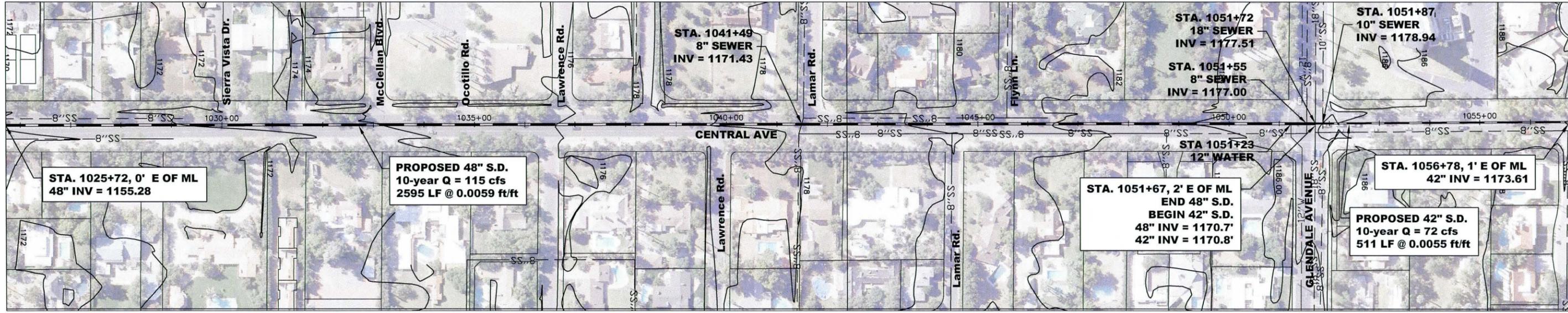
Existing Central Avenue Bridle Path (East Side Looking South)



Simulation of Proposed Catch Basin Along Central Avenue Bridle Path (East Side Looking South)

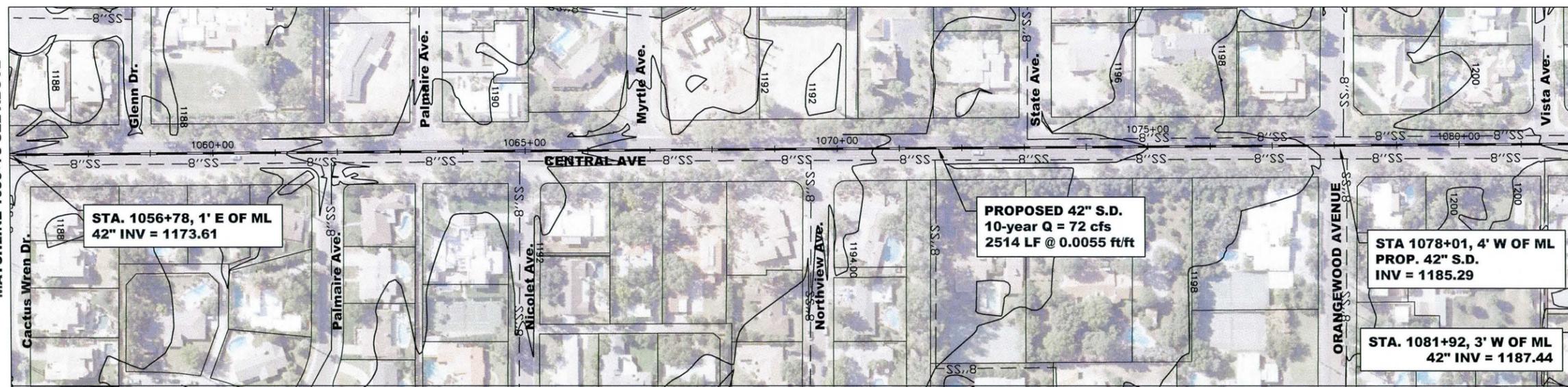


MATCHLINE 1025+72 SEE BELOW



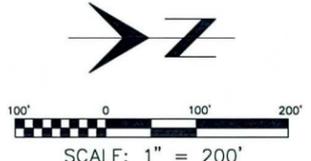
MATCHLINE 1025+72 SEE ABOVE

MATCHLINE 1056+78 SEE BELOW



MATCHLINE 1056+78 SEE ABOVE

MATCHLINE 1081+92 SEE SHEET 2



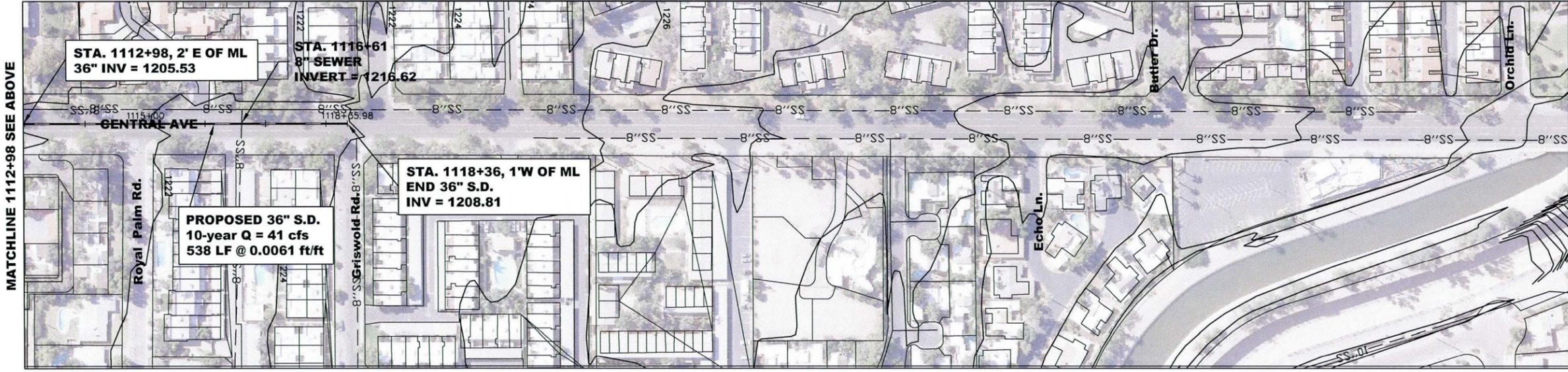
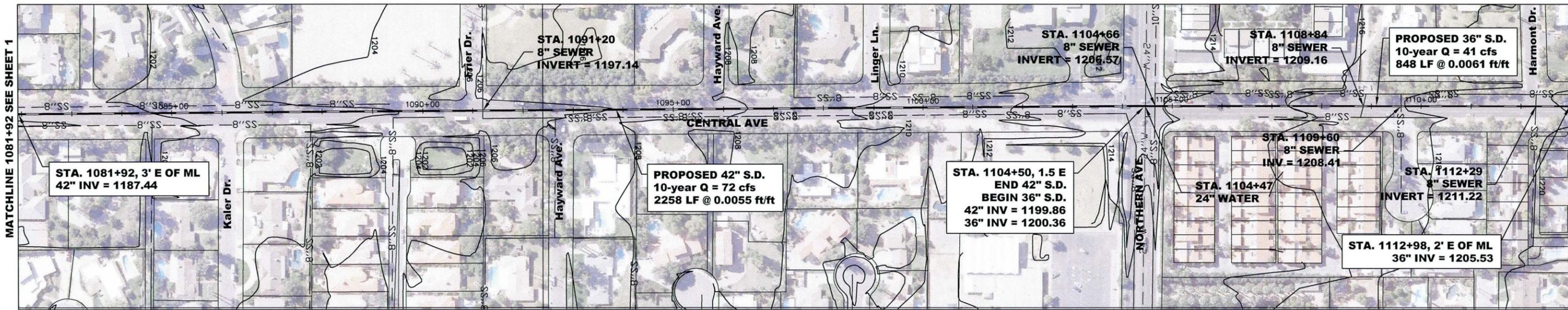
CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
CENTRAL AVE STORM DRAIN Bethany Home Rd. to Orangewood Ave.			
	PLAN SHEET		SHEET OF
	STA. 1000+00 to STA. 1081+92		01 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
CENTRAL AVE STORM DRAIN Bethany Home Rd. to Orangewood Ave.			
	PLAN SHEET		SHEET OF
	STA. 1081+92 TO STA. 1118+36		02 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX C
3RD AVENUE STORM DRAIN
Bethany Home Road to Encanto Golf Course

3rd Avenue Storm Drain-Bethany Home Rd. to Encanto Municipal Golf Course-10-year Storm Drain

The proposed 3rd Avenue storm drain begins at Bethany Home Road and outlets to the proposed Encanto Municipal Golf Course Detention Basin. The purpose of this additional storm drain is to intercept storm water in excess of the 2-year storm that will bypass the Central Avenue storm drain and thereby increase the level of protection from 2-year to 10-year for the area between Central Avenue and 5th Avenue. The watershed area is from 5th Avenue to Central Avenue between Maryland Avenue to Thomas Road, as depicted on the attached figure.

The 3rd Avenue storm drain begins at Bethany Home Road and conveys storm water south to Thomas Road and then west to 7th Avenue. At 7th Avenue it turns south and then west in Cambridge Avenue where it outfalls in the proposed Encanto Golf Course Detention Basin.



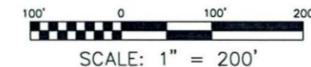
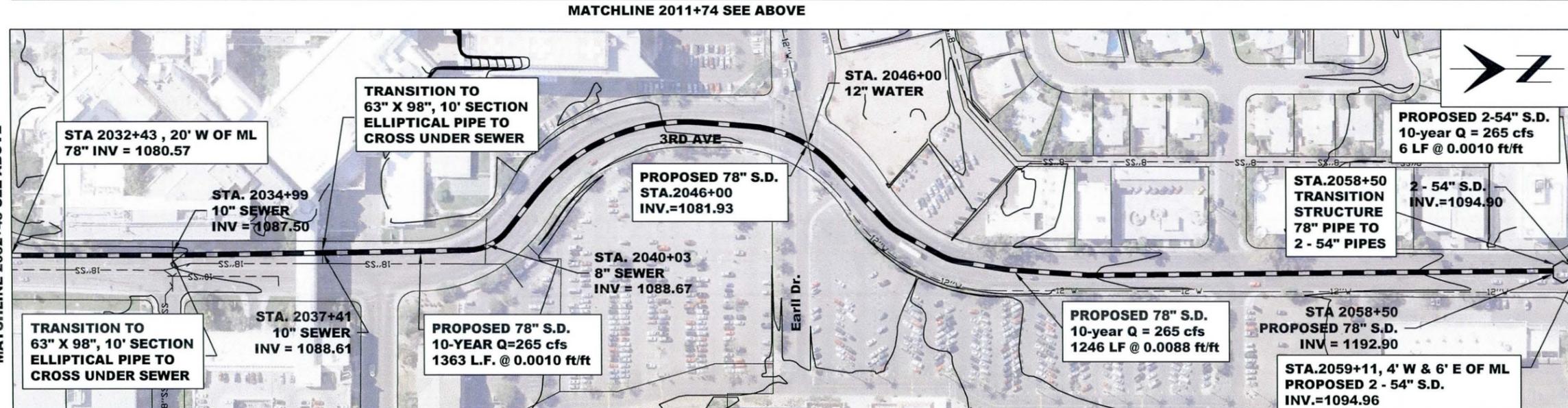
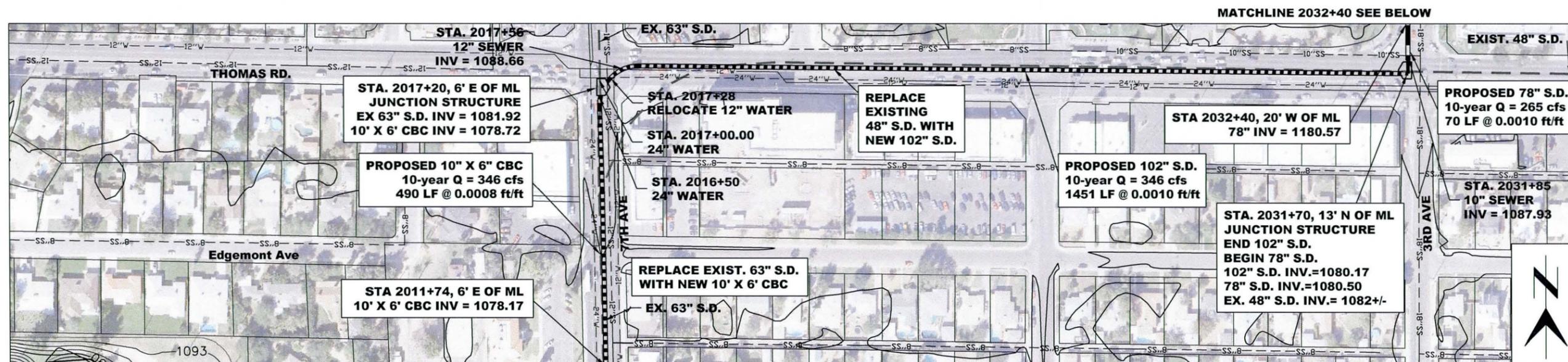
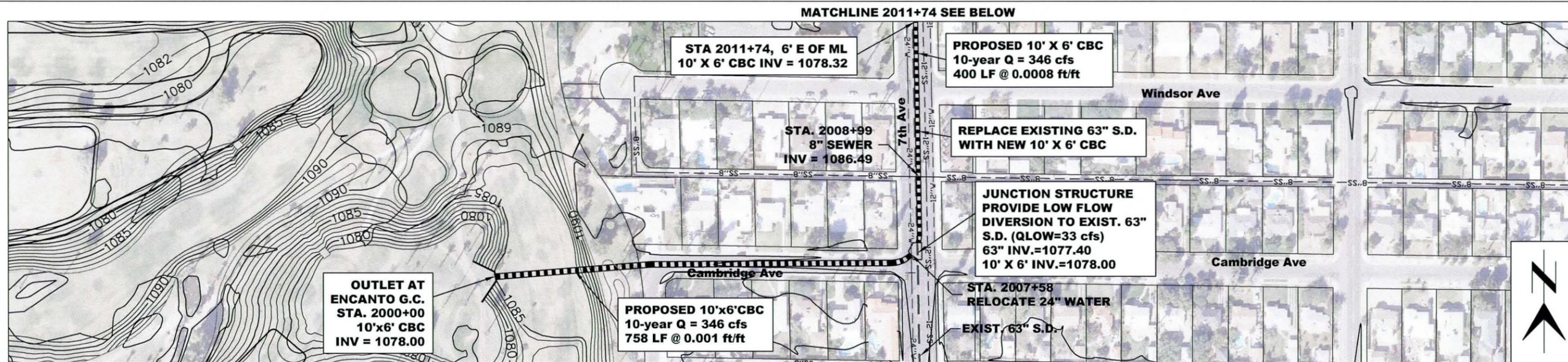
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- The proposed Encanto Golf Course Detention Basin needs to be constructed prior to the storm drain.
- The storm drain must pass under the Grand Canal. The final designer shall ascertain the exact depth of the Grand Canal to verify required pipe cover.
- Construction of the storm drain will require a jack and bore operation at Camelback Road to cross under the Metro Light Rail.
- The new 102-inch storm drain along Thomas Road replaces an existing 48-inch storm drain, which shall be removed.
- There are two sections of elliptical pipe, each 10 feet long, north of Thomas Road to avoid conflicts with existing sewer lines (they are not in the cost estimate as the pipe is similar to the 72-inch storm drain).
- Dual pipe is employed between Osborn Road and Indian School Road, in lieu of single pipe in order to maintain a shallower profile and run under existing sewer lines. The storm drain transitions

between 2 – 54” pipes to 3 – 36” pipes to avoid conflicts with sewers.

- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The new 10’x6’ CBC in 7th Avenue replaces the existing 63-inch storm drain, which shall be removed.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

3rd Avenue Storm Drain		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	30" SD in 3rd Ave, Camelback to Bethany Home STA. 2138+50 TO STA. 2191+30	LF	\$420.11	5280	\$ 2,218,159
2	42" SD in 3rd Ave, Highland to Camelback STA. 2125+50 TO STA. 2138+50	LF	\$555.02	1300	\$ 721,524
3	60" SD in 3rd Ave, Grand Canal to Highland STA. 2116+70 TO STA. 2125+50	LF	\$744.75	880	\$ 655,378
4	66" SD in 3rd Ave, Indian School to Grand Canal STA. 2085+00 TO STA. 2116+70	LF	\$806.66	3170	\$ 2,557,125
5	36" SD in 3rd Ave, Indian School intersection STA. 2084+50 TO STA. 2085+00	LF	\$479.85	150	\$ 71,978
6	54" SD in 3rd Ave, Osborn to Indian School STA. 2058+50 TO STA. 2085+10	LF	\$680.99	5320	\$ 3,622,889
7	78" SD in 3rd ave, Thomas to Osborn STA. 2031+70 TO STA. 2058+50	LF	\$931.64	2680	\$ 2,496,789
8	102" SD in Thomas Rd, 7th Ave to 3rd Ave STA. 2017+20 TO STA. 2031+70	LF	\$1,195.49	1450	\$ 1,733,462
9	10'x6' CBC SD in 7th Ave, Encanto to Thomas STA. 2000+00 TO STA. 2017+20	LF	\$1,501.58	1720	\$ 2,582,715
10	30" SD Lateral in Bethany Home Rd., 2nd Ave. to 3rd Ave.	LF	\$420.11	1000	\$ 420,106
11	30" SD Lateral in Bethany Home Rd., 5th Ave. to 3rd Ave.	LF	\$420.11	1000	\$ 420,106
12	Remove Existing Storm Drain	LF	\$100.00	2400	\$ 240,000
13	Jack and Bore under Metro Light Rail	EA	\$50,000.00	1	\$ 50,000
14	Junction Structure	EA	\$50,000.00	3	\$ 150,000
15	Transition Structure	EA	\$50,000.00	6	\$ 300,000
Sub Total					\$ 18,240,230
Contingencies (20%)					\$ 3,648,046
TOTAL					\$ 21,888,300



CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

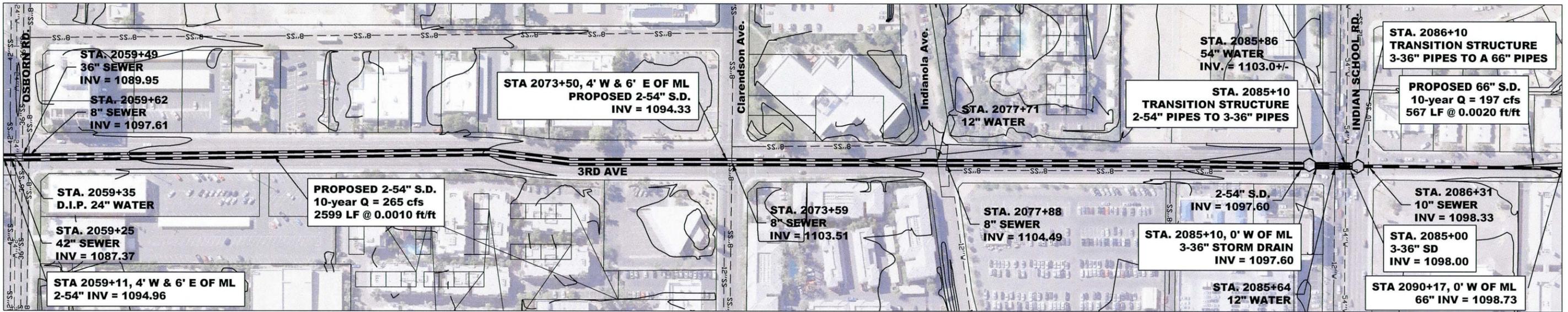
METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

3RD AVE STORM DRAIN
Encanto G.C. to Earle Dr.

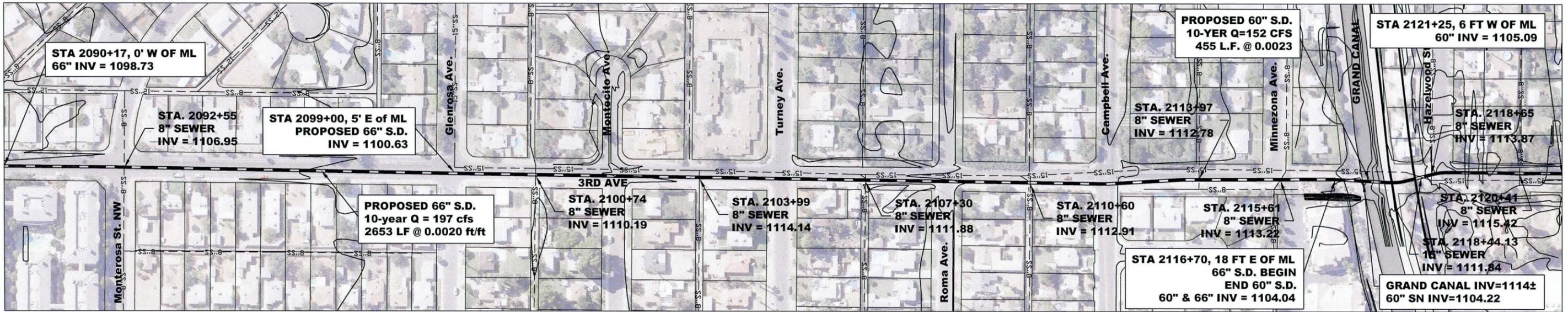
CONCEPT PLANS NOT FOR CONSTRUCTION	eec	PLAN SHEET	SHEET OF
		STA. 2000+00 to STA. 2059+11	01 03

MATCHLINE 2059+11 SEE SHEET 1



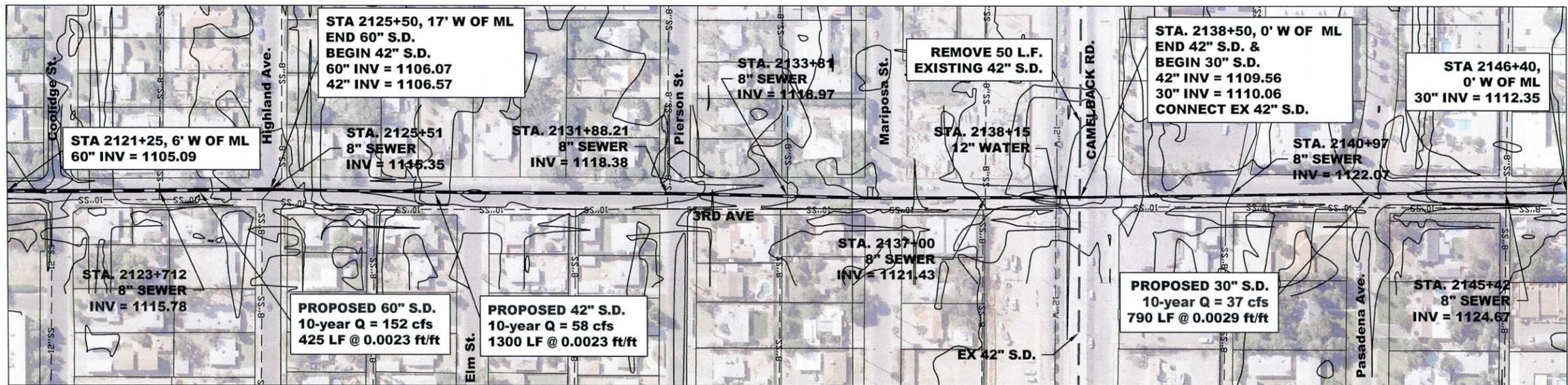
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MATCHLINE 2090+17 SEE ABOVE

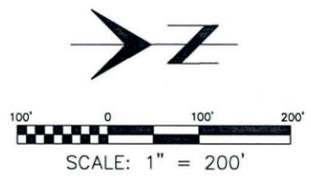


MATCHLINE 2121+25 SEE BELOW

MATCHLINE 2121+25 SEE ABOVE



MATCHLINE 2146+40 SEE SHEET 3

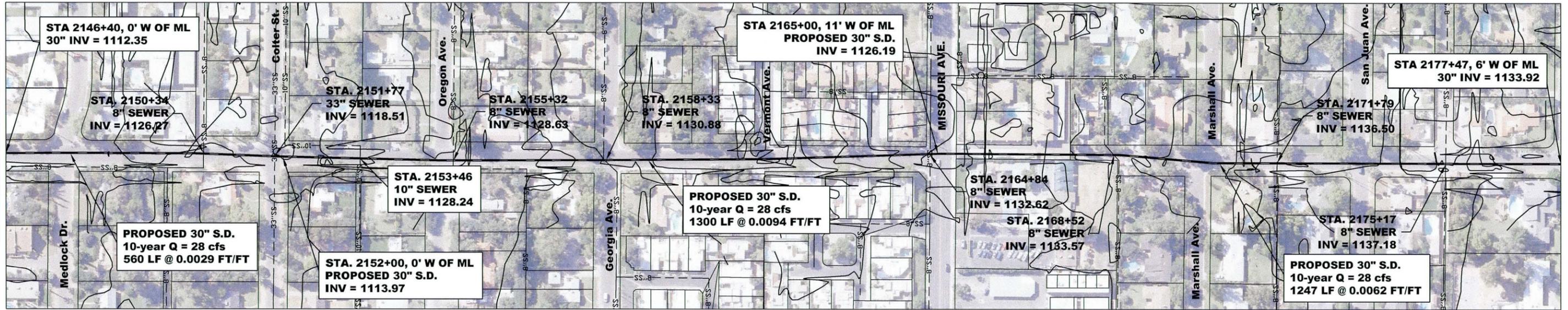


CAVE CREEK FLOODPLAIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**
 METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
3RD AVE STORM DRAIN Earl Dr. to Camelback Rd.			
PLAN SHEET		SHEET OF	
STA. 2059+11 to STA. 2146+40		02 03	

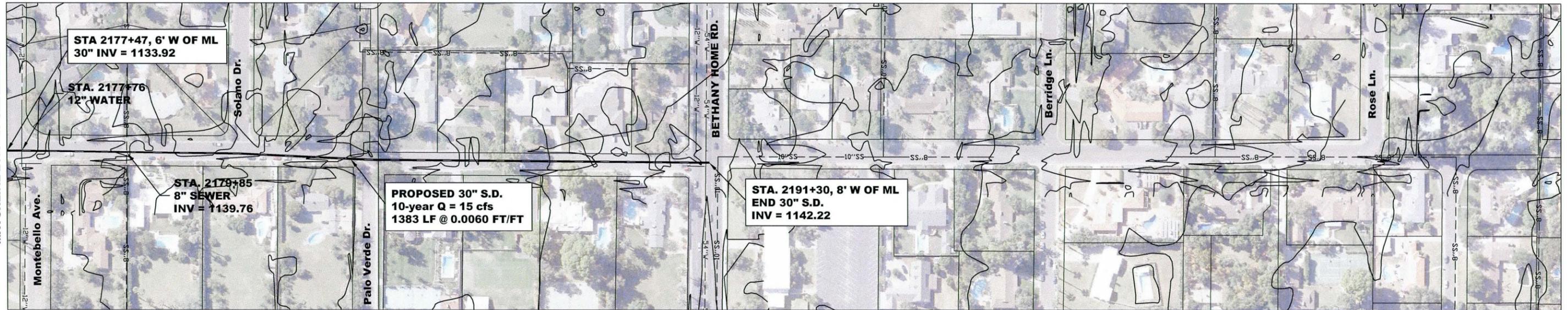
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 2146+40 SEE SHEET 2



MATCHLINE 2177+47 SEE BELOW

MATCHLINE 2177+47 SEE ABOVE



SCALE: 1" = 200'

CAVE CREEK FLOODPLAIN

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED CTG	09/08
	DRAWN KLH, SB	09/08
	CHECKED LAV	09/08

3RD AVE STORM DRAIN
Camelback Rd. to Bethony Home Rd.

eec	PLAN SHEET	SHEET OF
	STA. 2146+40 to STA. 2191+30	03 03

APPENDIX D
15TH AVENUE STORM DRAIN
Butler Drive to Palo Verde Golf Course

15th Avenue Storm Drain – Butler Dr. to Palo Verde Golf Course – 10-year Storm Drain

The new 15th Avenue storm drain begins ½ mile north of Northern Avenue and continues south to Maryland Avenue. The proposed storm drain parallels an existing storm drain and together the two pipes provide a 10-year level of protection for the watershed between 9th Avenue and 17th Avenue from Arizona Canal to Maryland Avenue. This storm drain project will also include additional inlets and laterals to be connected to the existing 7th Avenue storm drain in order to provide a 10-year level of protection for the combined watershed that lies between 17th Avenue and 5th Avenue from Arizona Canal to Maryland Avenue.

A new junction structure at Maryland Avenue combines the new storm drain in 15th Avenue with the existing 42” lateral in Maryland Avenue. Just south of Maryland Avenue, a second new junction structure combines the two 15th Avenue storm drains and then splits the flow; maintaining a small low flow in the existing 15th Avenue storm drain while diverting the remainder of the storm water into the proposed Palo Verde Golf Course Detention Basin. The detention basin is emptied by flowing back through the same 2-72” inflow pipes; discharging back into the existing 15th Avenue storm drain at a maximum flow rate of about 50 cfs. The existing 15th Avenue storm drain ultimately outlets at the Salt River.



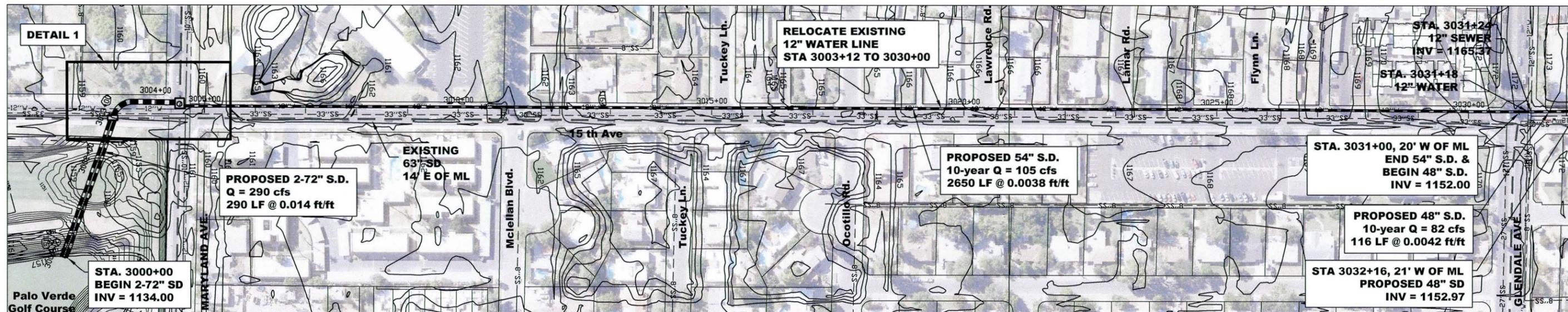
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed including the watershed for both the 15th Avenue and 7th Avenue storm drains.
- The proposed Palo Verde Golf Course Detention Basin needs to be in place for the storm drain to outlet to. The final design of the golf course will also influence the design of the junction structure at Maryland Avenue.
- 15th Avenue has many existing utilities within the right of way. Installing a new parallel storm drain will require the relocation of a 12” waterline for approximately 2700’.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- Junction structure #1, located in the intersection of Maryland and 15th Avenue, will combine the flows from the existing 42” storm drain lateral in Maryland Avenue and the proposed 54” storm drain in 15th Avenue.
- Junction Structure #2, located at the discharge point into the proposed Palo Verde Golf Course Detention Basin, will combine flow from the existing 15th Avenue storm drain with the flow from Junction Structure #1. Approximately 25

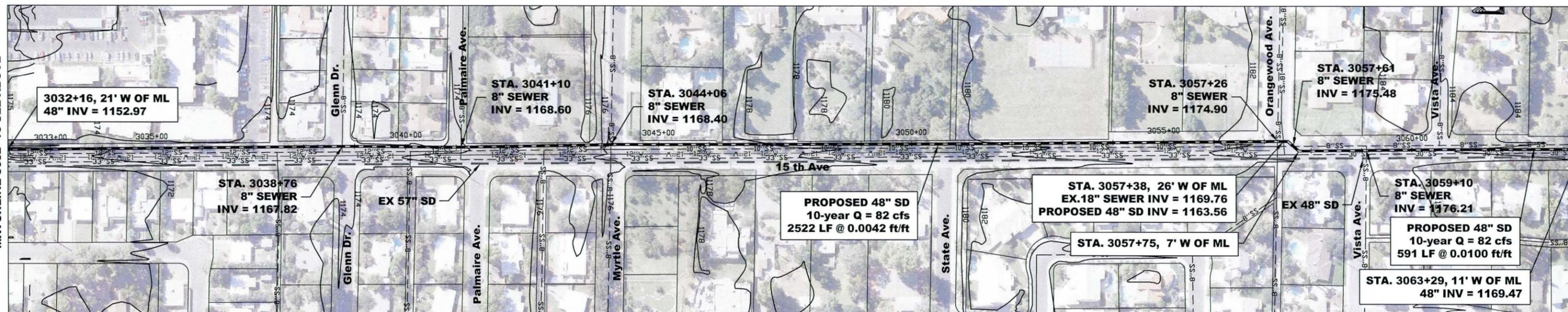
cfs will bypass the proposed Palo Verde Golf Course Detention Basin. Flow in excess of 25 cfs will discharge to the proposed detention basin through 2-72” storm drains.

- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

15th Avenue Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	42" SD in 15th Avenue, Northern to Butler STA. 3083+50 TO STA. 3110+43	LF	\$555.02	2693	\$ 1,494,664
2	48" SD in 15th Avenue, Glendale Ave to Northern STA. 3031+00 TO STA. 3083+50	LF	\$617.20	5250	\$ 3,240,294
3	54" SD in 15th Avenue, Maryland to Glendale STA. 3004+25 TO STA. 3031+00	LF	\$680.99	2675	\$ 1,821,660
4	42" SD Lateral in Butler, 17th Ave to 15th Ave	LF	\$555.02	1170	\$ 649,371
5	42" SD Lateral in Northern, 17th Ave to 15th Ave	LF	\$555.02	1530	\$ 849,178
6	30" SD Lateral in Northern, 9th Ave to 15th Ave	LF	\$420.11	1950	\$ 819,206
7	42" SD Lateral in Orangewood, 17th Ave to 15th Ave	LF	\$555.02	1470	\$ 815,877
8	36" SD Lateral in Vista, 11th Ave to 15th Ave	LF	\$479.85	1300	\$ 623,805
9	36" SD Lateral in Myrtle, 11th Ave to 15th Ave	LF	\$479.85	1300	\$ 623,805
10	54" SD Lateral in Ocotillo, 11th Ave to 15th Ave	LF	\$680.99	1850	\$ 1,259,839
11	54" SD Lateral in McLellan, 17th Ave to 15th Ave	LF	\$680.99	2300	\$ 1,566,287
12	42" SD, Connect existing Pipes between 19th and 17th Avenue	LF	\$555.02	1400	\$ 777,026
13	72" SD from 15th Ave to Lake (Palo Verde Golf Course)	LF	\$869.15	560	\$ 486,724
14	Headwall for 2-72" Pipes	EA	\$5,000.00	1	\$ 5,000
15	Junction Structure #1, Intersection of 15th Ave and Maryland	EA	\$25,000.00	1	\$ 25,000
16	Junction Structure #2, 15th Ave. south of Maryland	EA	\$50,000.00	1	\$ 50,000
17	10' x 3' SD in 15th Ave from Structure #1 to Structure #2	LF	\$1,375.93	140	\$ 192,630
18	Utility Relocation - 12" Waterline STA. 3003+12 TO STA. 3030+00	LF	\$100.00	2688	\$ 268,800
Sub Total					\$ 15,569,167
Contingencies (20%)					\$ 3,113,833
TOTAL					\$ 18,683,000



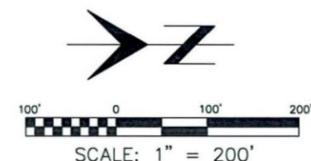
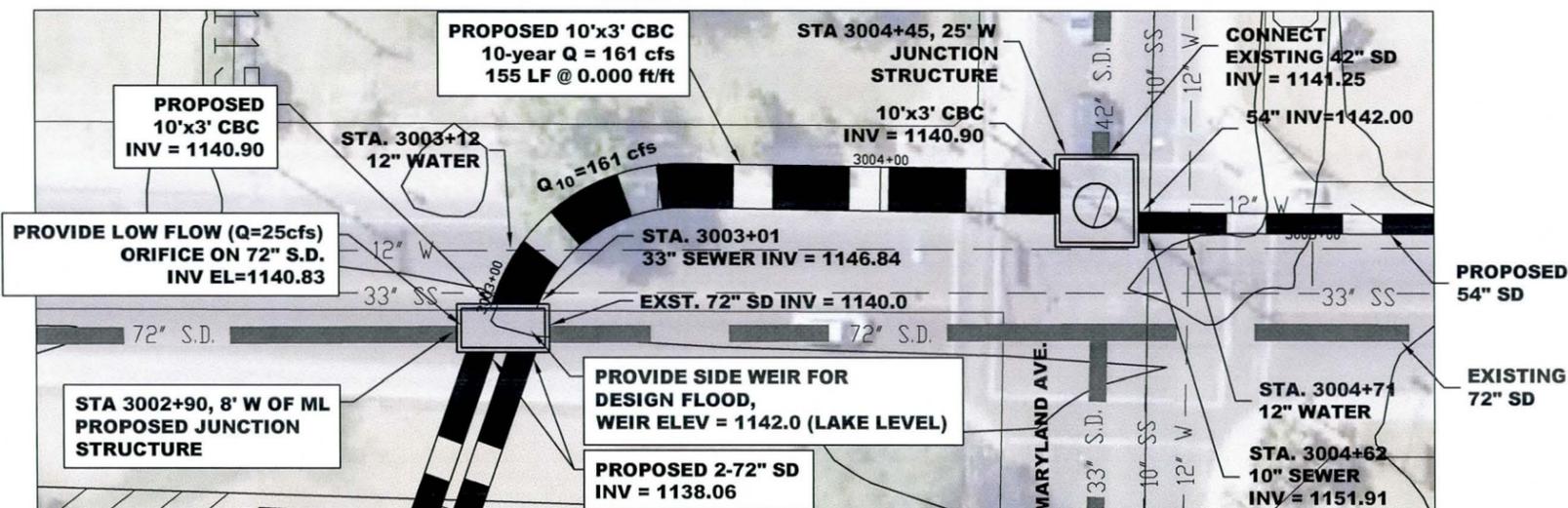
MATCHLINE 3032+16 SEE BELOW



MATCHLINE 3032+16 SEE ABOVE

MATCHLINE 3063+29 SEE SHEET 2

DETAIL 1
SCALE: 1" = 40'



CAVE CREEK FLOODPLAIN

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

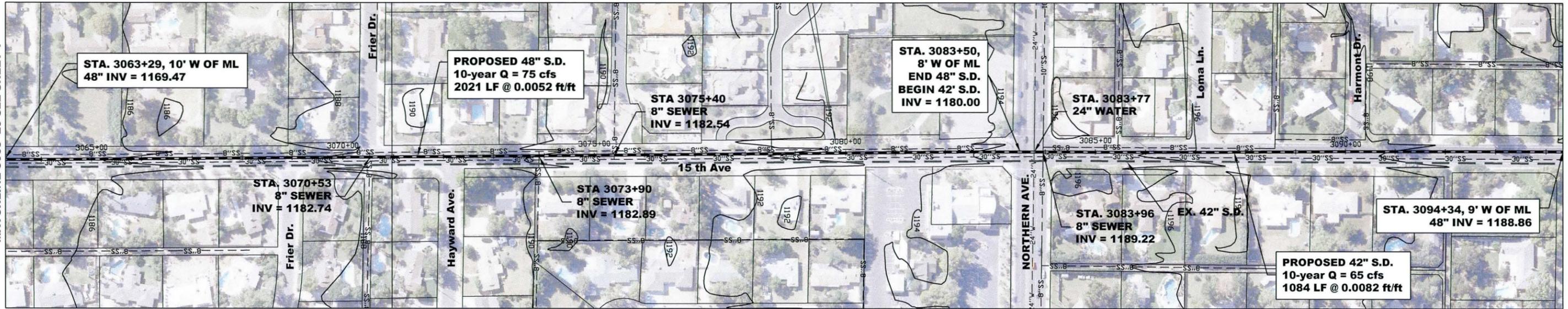
CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08

15TH AVE (NORTH) SD
Palo Verde GC to Orangewood Ave

ecc	PLAN SHEET	SHEET OF
	STA. 3000+00 to STA. 3063+29	01 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 3063+29 SEE SHEET 1



MATCHLINE 3094+34 SEE BELOW

MATCHLINE 3094+34 SEE ABOVE



100' 0 100' 200'
SCALE: 1" = 200'

CAVE CREEK FLOODPLAIN
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

15TH AVE (NORTH) SD
Drangewood Ave to Butler Dr

PLAN SHEET SHEET OF
STA. 3063+29 to STA. 3110+43 02 02



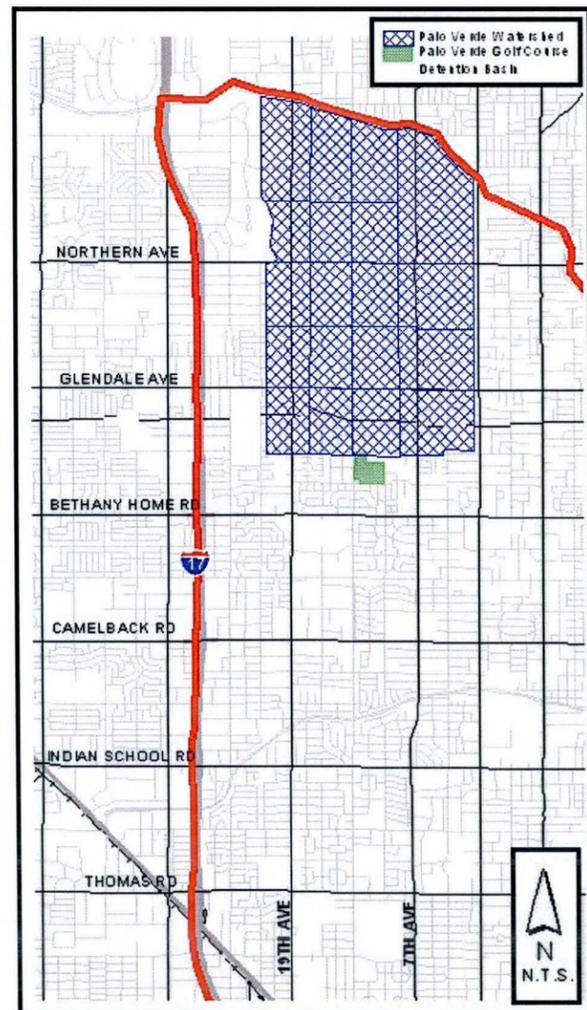
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AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX E
PALO VERDE GOLF COURSE

Storage at Palo Verde Golf Course– 10-year

The Palo Verde Golf Course is the proposed location for a new regional detention basin. The goal of the basin would be to detain runoff from the contributing watershed between Central Avenue and 21st Avenue from Arizona Canal to Maryland Avenue, with the basin sized for the 10-year runoff volume (75 acre-feet) with 1’ of freeboard (130 acre-feet). The detention basin is designed to empty in 16 hours by discharging at metered rate (maximum rate 50 cfs) into the existing 15th Avenue storm drain.

The Palo Verde Golf Course is ideally situated for a detention basin because it lies in the low flow area of the Old Cave Creek Wash Floodplain. Therefore, surface flow naturally travels toward the detention basin. The golf course is proposed to be designed (see the accompanying plan) in such a way as to maintain its current recreational use and enhance the course by giving it a contoured appearance and making it more interesting to play. The parking lot, clubhouse, tee boxes and greens would be elevated above the high water elevation for the 10-year design flood. The lake, driving range and non-play areas would provide the primary flood storage while the fairways would provide secondary storage. The fairways are purposely set 6 to 8 feet above the bottom of the primary storage areas so that they would only be inundated during very large floods. The grading is designed so that stored floodwaters can migrate back to the lake and out to the 15th Avenue storm drain, without any low spots, avoiding any long term ponding in the golf course.



Design Elements/Constraints

- The golf course detention basin shall be designed to maintain the 10-year volume of 75 acre-feet with a 1’ of freeboard. (130 acre-feet at a spill elevation of 1155.0’). The final design should input the new stage-storage-discharge relationship in the HEC-1 model to verify the results. The design presented in the recommended plan is only a concept. The final design could be done in any manner as long as the 10-year storage volume plus 1’ of freeboard is met.
- The design is for the 10-year storm. Events larger than this will overtop the detention basin and return to the streets as surface flow.
- There is an existing farm house and silo on the golf course which is a historic property called the William McElroy Farm. The farm house is being preserved, but it has been assumed that the silo can be removed. Mitigation for the removal of the silo may be required.
- Utilize the existing storm drain in 15th Avenue as a receptor for the low flow by-pass and the storm water outlet from the detention basin.
- Keep the clubhouse, parking lot, greens, and tees above the high water elevation for the 10-year design flood.

- The driving range and non-play areas shall provide primary storage within the golf course and shall be graded with positive drainage toward the basin outlet to avoid long term ponding on the golf course.
- Cart paths and fairways shall be elevated 6 to 8 feet above the bottom of the primary storage areas.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Social Considerations

Public comments indicated a high level of support for new storm drains and floodwater storage at the Palo Verde golf course. Within the Cave Creek area, the recommended drainage plan incorporates new storm drains and floodwater storage at the Palo Verde golf course. The suburban park landscape theme selected for the golf course is highly supported by the public.

Palo Verde Golf Course		Unit	Price	Quantity	Amount
Item No.	Item Description				
1	42" SD, Connect existing 7th Avenue Storm Drain to Golf Course	LF	\$555.02	2200	\$ 1,221,040
2	42" SD from Maryland Ave to Lake (Palo Verde Golf Course)	LF	\$555.02	160	\$ 88,803
3	48" Culvert in Palo Verde Golf Course	LF	\$617.20	406	\$ 250,583
4	60" Culvert in Palo Verde Golf Course	LF	\$744.75	265	\$ 197,358
5	72" SD from 15th Ave to Lake (Palo Verde Golf Course)	LF	\$869.15	638	\$ 554,518
6	Headwall, for 48" Pipe	EA	\$2,500.00	4	\$ 10,000
7	Headwall for 60" Pipe	EA	\$2,800.00	1	\$ 2,800
8	Headwall for 2-72" Pipes	EA	\$5,000.00	1	\$ 5,000
9	Excavation and Haul (18 mile round trip)	CY	\$14.00	318000	\$ 4,452,000
10	Retaining Wall, Height = 12 ft, Length = 320 ft, ADOT Det. B-18.10	SF	\$62.85	3840	\$ 241,344
11	Reconstruct Golf Course (9 holes, 27 acres)	LS	\$3,500,000.00	1	\$ 3,500,000
Sub Total					\$ 10,523,446
Contingencies (20%)					\$ 2,104,689
TOTAL					\$ 12,628,100

Palo Verde Golf Course Landscape Design Guidelines

Proposed Retention Basin and Rehabilitated Golf Course

This recommended alternative provides multi-purpose opportunity that would improve both flooding issues, and recreation use. The reconstruction of the golf course would create a multi-use facility by providing floodwater storage, and by improving the course's golf marketing appeal and aesthetic qualities.

In conjunction with other storm drain improvements, as a floodwater storage facility, the golf course will reduce the frequency of flooding by increasing the capacity of the local drainage system from a 2-year system to a 10-year system. The golf course will provide significant storm water capacity by lowering the fairways and non-play areas of the course in a tiering fashion approximately 5ft–15ft below street level. The design of the golf course/flood storage facility shall be sensitive to the landscape character of the surrounding neighborhoods and designed to blend with the adjacent properties.

Landscape Design Theme

The Suburban Park Landscape Design Theme was chosen for Palo Verde Golf Course based on its existing contextual landscape setting. The surrounding landscape setting consists of shrubs, palms, mature trees, and lawns. There are a few homes that have converted to desert landscaping, which are exceptions to the fairly intact lush landscape character of the surrounding neighborhoods. The chosen theme is reinforced by the City of Phoenix Parks and Recreation Department's desire to preserve the turf park character for their parks that lie south of the Arizona Canal.

This theme consists of flood control structures that accentuate the natural topography and create landscape variety and visual interest. Surface treatments consist primarily of turf with inert materials in non-use areas. Plant materials consist of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space.

Landscape and Recreation Design Guidelines

During the ADMP study process, discussions with the stakeholders developed several recommendations and guidelines that shall be addressed during the design process for the rehabilitated golf course. Certainly, a golf course architect will need to be involved in this effort to insure that proper golf course design and construction requirements are achieved. In addition to typical golf course design elements, unique elements and considerations brought about from the multi-use flood storage requirements will need to be addressed. The following are general design recommendations:

- Maintain the golf tees and greens at or above the 10-year flood level.
- Provide a soils management plan for the beneficial use of existing top soils.
- Provide gentle slopes, berming, and views into the course at the perimeter. Maximum height of perimeter berms should be 4-feet, with 70% of the perimeter berms being 3-feet or less in height.
- A goal of the preliminary design of the golf course was to maintain mature trees. The golf course rehabilitation will still require the removal and/or salvage of numerous trees. A plant inventory will be required and the trees on the golf course will need to be evaluated in terms of historic significance, being salvageable, maintenance, and overall suitability for the golf course character.

- The City Parks and Recreation Department's policy regarding tree removal and replacement for canopy replacement equivalency shall be reviewed.
- Evaluate and provide for accessibility within the golf course. New golf course designs are required to provide reasonable accommodations for disabled individuals. The ADA Accessibility Guidelines (ADAAG) is the standard for complying with the ADA. Although this will not be a typical golf course design because of the flood water storage function, access accommodations should be considered and reviewed for compliance.
- In combination with city zoning requirements, provide a typical 20-40 foot variable width setback from property lines and roadways to help provide a visual transition to the basins with surrounding streetscape and residential properties. Emphasis should be placed on providing the widest possible setback adjacent to residential properties with a minimum setback being 10 feet.
- The overall configuration of the basins should be irregular and free-form.
- Preserve the historic Williams McElroy farmhouse.
- The stormwater quality entering the Palo Verde Golf Course Lake will need to be addressed in the final design. There will need to be treatments at the inlet/outlet to maintain water quality within the golf course.
- The design and functionality of the driving range is important due to the large amount of revenue it generates. Alternative surfacing and subsurface drainage concepts should be considered to reduce down time as much as possible, such as artificial turf and subsurface drainage rock.
- The drain time (16 hours) is a concern due to the loss of revenue when the course is shut down. The idea of a gate valve may be added to drain the course more quickly, but FCD/COP would need to work out a plan for this in final design,
- Lake design must maintain the existing storage volume, at a minimum, for irrigation.
- Side slopes must be graded to allow for mowing.
- Cart paths should run the entire length of the course in order to have the control of requiring carts to stay on the path when the course is wet.

Palo Verde Golf Course Recommended Plant PaletteTrees

<u>Botanical Name</u>	<u>Common Name</u>
<i>Existing</i>	
<i>Eucalyptus var.</i>	<i>Eucalyptus</i>
<i>Washingtonia robusta</i>	<i>Mexican Fan Palm</i>
<i>Washingtonia filifera</i>	<i>California Fan Palm</i>
<i>Phoenix dactylifera</i>	<i>Date Palm</i>
<i>Vitex angus-castus</i>	<i>Chaste Tree</i>
<i>Olea europia</i>	<i>Olive fruitless var.</i>
<i>Pinus halepensis</i>	<i>Aleppo Pine</i>
<i>Pinus elderica</i>	<i>Mondel Pine</i>
<i>Rhus lancea</i>	<i>African Sumac</i>

Proposed

<i>Acacia aneura</i>	<i>Mulga</i>
<i>Dalbergia sissoo</i>	<i>Sissoo</i>
<i>Quercus var.</i>	<i>Oak</i>
<i>Ulmus parviflora</i>	<i>Chinese Evergreen Elm</i>
<i>Fraxinus var.</i>	<i>Ash</i>

Shrubs

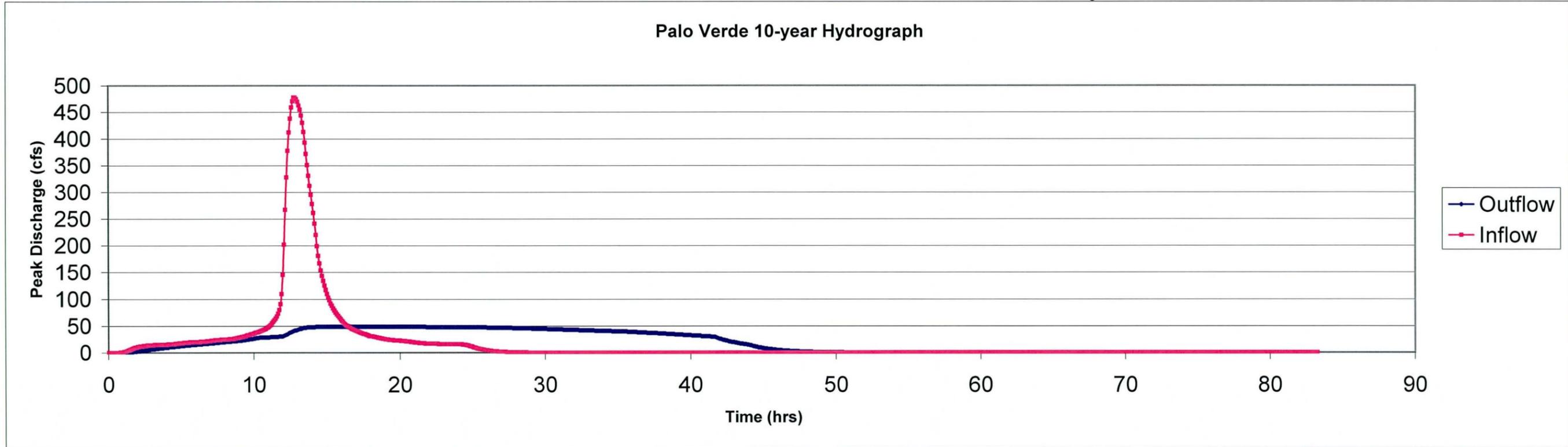
<u>Botanical Name</u>	<u>Common Name</u>
<i>Existing</i>	
<i>Nerium Oleander</i>	<i>White Oleander</i>
<i>Nerium Oleander</i>	<i>Red Oleander</i>
<i>Leucophyllum var.</i>	<i>Sage</i>
<i>Hesperaloe var.</i>	<i>Hesperaloe</i>
<i>Lantana var.</i>	<i>Lantana</i>

Proposed

<i>Nerium oleander petite</i>	<i>Petite Oleander</i>
<i>Caesalpinia pulcherrima</i>	<i>Red Bird of Paradise</i>
<i>Bougainvillea var.</i>	<i>Bougainvillea</i>

Palo Verde Detention Basin Calculation Summary

Palo Verde 10-year Hydrograph



Stage-Storage Discharge Summary

					Peak			
Volume (acre-feet)	0	4.6	21.5	52.6	76	87.7	131.2	132
Elevation (feet)	1142	1145	1148	1151	1152.3	1153	1155	1156
Discharge (cfs)	0	29	39	47	49	50	50	950

Note: Spill elevation = 1155 (above elevation 1155, floodwaters spill into 15th Avenue).

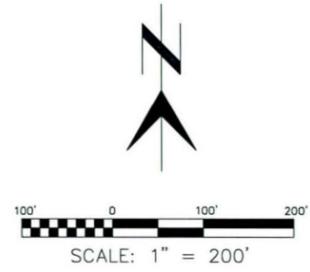
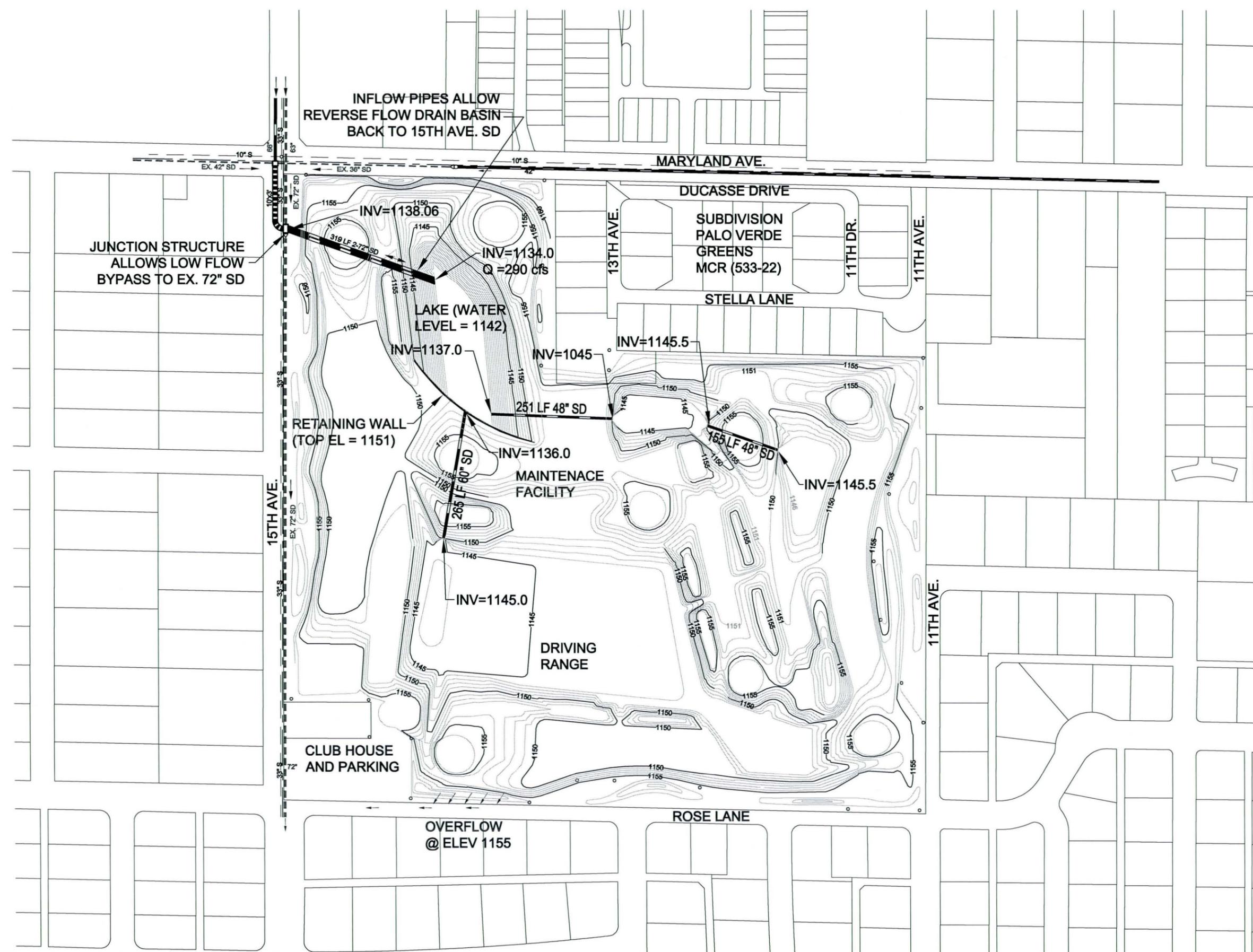
Volume Calculation

Elevation	Area	Area	Incremental	Incremental	Cumulative
	(sq. ft.)	(acres)	Volume (cubic feet)	Volume (acre-feet)	Volume (acre-feet)
1142	48461	1.1	0	0.0	0
1143	51525	1.2	49985	1.1	1
1144	62605	1.4	56975	1.3	2
1145	125091	2.9	92063	2.1	5
1146	231205	5.3	175453	4.0	9
1147	288184	6.6	259172	5.9	15
1148	316659	7.3	302310	6.9	21
1149	347216	8.0	331820	7.6	29
1150	516612	11.9	429119	9.9	39
1151	672250	15.4	592726	13.6	53
1152	772357	17.7	721725	16.6	69
1153	847721	19.5	809747	18.6	88
1154	952768	21.9	899733	20.7	108
1155	1032934	23.7	992581	22.8	131

Stage/Volume versus Time

Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume
0	1142.0	0.0	13	1149.5	37.1	26	1151.0	52.6
1	1142.0	0.0	14	1151.7	64.3	27	1151.0	52.6
2	1142.3	0.5	15	1152.3	76.0	28	1150.6	48.7
3	1142.7	1.1	16	1152.3	76.0	29	1150.6	48.7
4	1143.0	1.6	17	1152.3	76.0	30	1150.3	44.8
5	1143.3	2.1	18	1152.3	76.0	31	1149.9	40.9
6	1143.6	2.4	19	1152.3	76.0	32	1149.5	37.1
7	1143.9	2.9	20	1152.3	76.0	33	1149.1	33.2
8	1144.1	3.2	21	1152.3	76.0	34	1148.8	29.3
9	1144.4	3.6	22	1151.7	64.3	35	1148.4	25.4
10	1144.8	4.3	23	1151.7	64.3	36	1148.0	21.5
11	1145.0	4.6	24	1151.7	64.3	37	1147.4	18.1
12	1145.6	8.0	25	1151.7	64.3	38	1147.1	16.4

Note: Fairway elevations are set at elevation 1150 or higher.



PALO VERDE GOLF COURSE

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08	

PALO VERDE GOLF COURSE



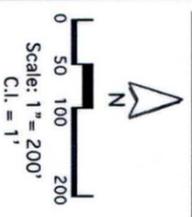
PLAN SHEET

SHEET OF

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



Metro Phoenix ADMP - Recommended Plan
Palo Verde Golf Course
 10-year Storage Basin/ Rehabilitated Golf Course
Concept Landscape Design



Gaylan & Barker, Inc.
 Engineering and Environmental
 Consultants, Inc. 140
 7878 N. Central Ave. Suite 1500
 Phoenix, Arizona 85020

AEC
 Arizona Flood Control District



Existing Palo Verde Golf Course - 2nd Hole



Proposed Retention Basin/ Rehabilitated Golf Course - 2nd Hole



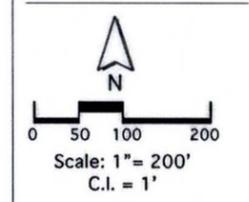
Existing Contours



Proposed Contouring



Metro Phoenix ADMP - Recommended Plan
 Palo Verde Golf Course
 10-year Storage Basin/ Rehabilitated Golf Course
 Simulation of New Contouring at 2nd Hole



APPENDIX F
THOMAS ROAD STORM DRAIN
24th Ave. to 18th Ave

Thomas Road Storm Drain from 24th Avenue to Encanto Golf Course - 10-year Storm Drain

The new Thomas Road storm drain begins at 24th Avenue and conveys storm water east in Thomas Road to 19th Avenue where it discharges into the proposed Encanto Golf Course Detention Basin. The contributing watershed, for this storm drain, is between the I-17 freeway and 19th Avenue, from Thomas Road to Osborn Road.

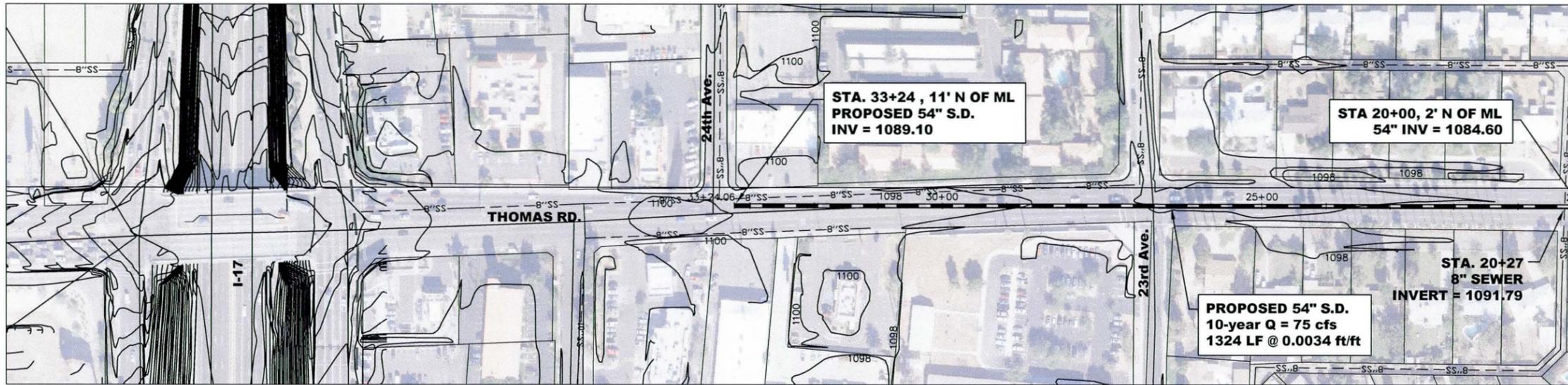
The storm drain begins at 24th Avenue and runs east to 19th Avenue where it combines in a junction structure with flow coming south in the existing 19th Avenue storm drain. A small portion, or low flows, of the combined flow continues south in the existing 19th Avenue storm drain; while larger flows will be diverted into the proposed Encanto Golf Course Detention basin.

Design Elements/Constraints

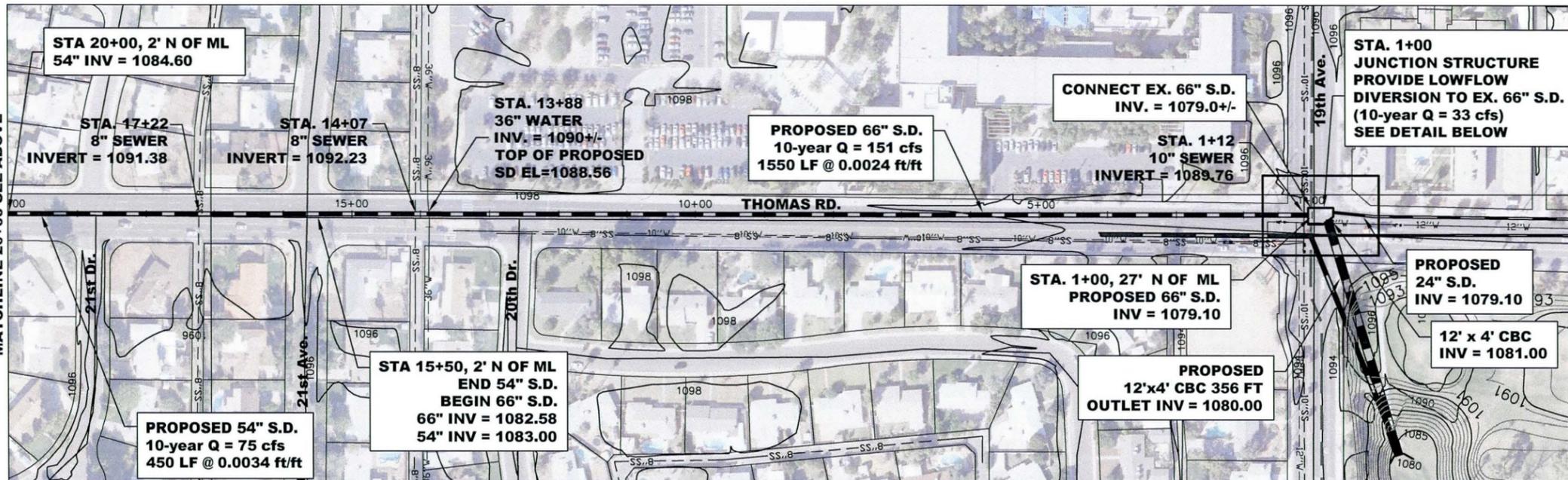
- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- The proposed Encanto Golf Course Detention Basin needs to be constructed prior to the storm drain.
- Designed for the 10-year collection and conveyance of storm water in Thomas Road.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Thomas Road Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	54" SD in Thomas Rd, 21st Ave to 24th Ave STA. 15+50 to STA. 33+24	LF	\$680.99	1774	\$ 1,208,084
2	66" SD in Thomas Rd, 19th ave to 21st Ave STA. 1+00 to STA. 15+50	LF	\$806.66	1450	\$ 1,169,663
3	12'x4' CBC Thomas Rd, Thoma/19th Ave to Encanto Outlet to STA. 1+00	LF	\$1,501.58	356	\$ 534,562
4	Junction Structure	EA	\$50,000.00	1	\$ 50,000
Sub Total					\$ 2,962,308
Contingencies (20%)					\$ 592,462
TOTAL					\$ 3,554,800



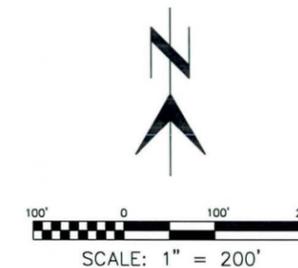
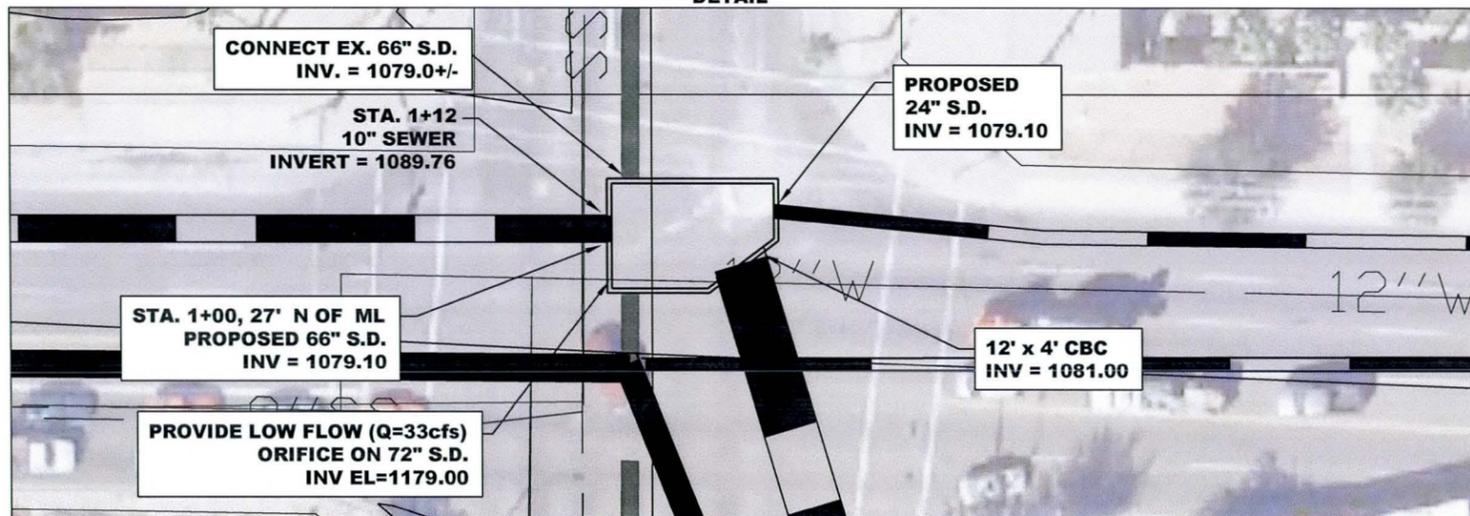


MATCHLINE 20+00 SEE BELOW



MATCHLINE 20+00 SEE ABOVE

DETAIL



CAVE CREEK FLOODPLAIN			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP			
PROJECT CONTROL NO. FCD2004C040			
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	BY	DATE
	DRAWN	CTG	09/08
	CHECKED	KLH, SB	09/08
	LAV	09/08	
THOMAS RD. STORM DRAIN			
19th Ave. to 24th Ave.			
PLAN SHEET		SHEET OF	
STA. 1+00 TO STA. 33+24		01 01	

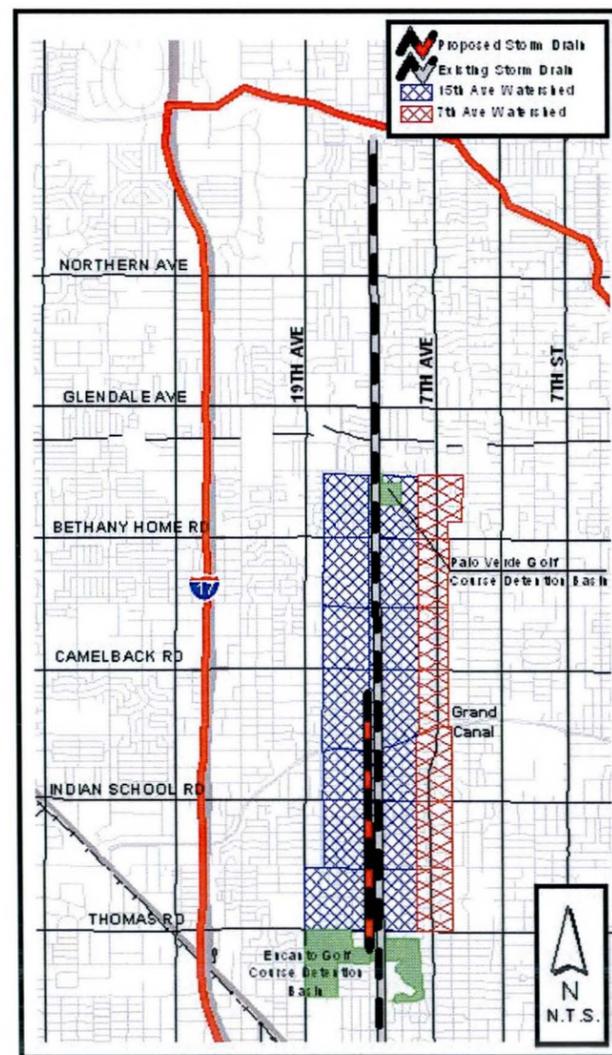
APPENDIX G
15TH AVENUE STORM DRAIN
Camelback Road to Encanto Golf Course

15th Avenue Storm Drain, Camelback Road to Encanto Golf Course – 10-year Storm Drain

The new 15th Avenue storm drain will run parallel to the existing 15th Avenue storm drain. The combination of the two storm drains will allow conveyance of the 10-year runoff from the contributing watershed which lies between 17th and 9th Avenue, from Thomas Road upstream to Maryland Avenue/Palo Verde Golf Course. The outfall for the 15th Avenue storm drain is the proposed Encanto Golf Course Detention Basin.

This project shall also include a drainage study for the existing 7th Avenue storm drain to verify that the existing inlets are capable of collecting the 10-year flood from its contributing watershed. If not, new inlets shall be installed on the 7th Avenue storm drain as part of this 15th Avenue storm drain project.

The proposed storm drain begins upstream of the Grand Canal, just south of Camelback Road, and runs south parallel to the existing storm drain in 15th Avenue and outlets to a new junction structure located 900 feet south of Thomas Road. The junction structure has a small diameter pipe that diverts the low flow to the existing 15th Avenue storm drain. Larger flows are diverted at the junction structure into the west side of the proposed Encanto Golf Course Detention Basin. The proposed 15th Avenue Underpass (See Appendix H) will act as an equalizer between the east and west sides of the proposed detention basin.



Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed; including the watershed for both of the 15th Avenue storm drains as well as the 7th Avenue storm drain. The efforts will include an analysis of the existing 15th Avenue storm drain between Palo Verde Golf Course and Camelback Road to upgrade the storm drain inlets from the existing 2-year design to a 10-year level of service.
- The proposed Encanto Golf Course Detention Basin needs to be constructed prior to the storm drain.
- The laterals that will connect to the existing 15th Avenue storm drain south of Maryland Avenue are part of this drainage area because it is the collection system for the proposed Encanto Golf Course Detention Basin.
- Water and sewer utility crossings have been

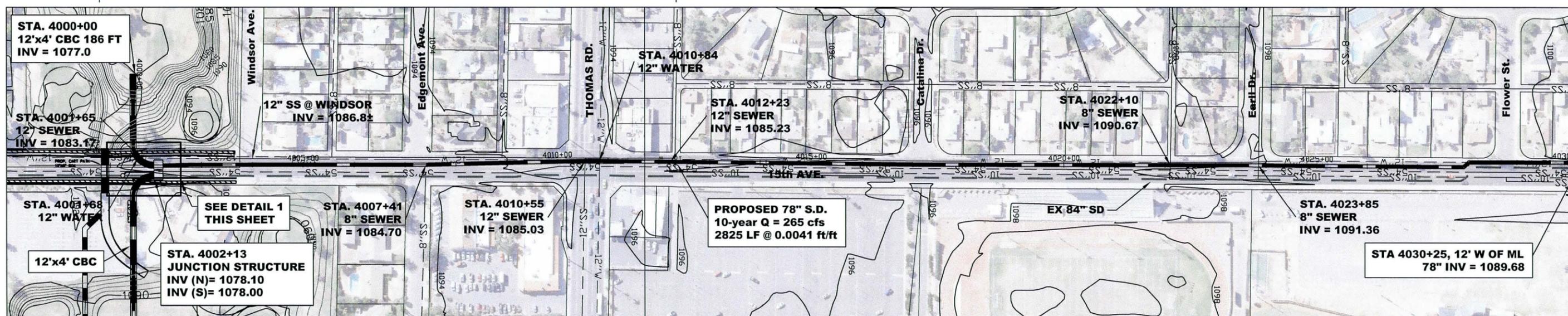
identified in the plan sheets. The 15th Avenue roadway, between Thomas Road and Osborn Road, is congested with other utilities and the alignment of the proposed storm drain is a tight fit. During the design phase, all the utilities will need to be further investigated.

- The existing 84-inch storm drain in 15th Avenue will be diverted into the proposed Encanto Golf Course Detention Basin with a low flow by-pass that allows flow to continue south in the existing 84-inch pipe. Larger floods flow through a 12 foot by 4 foot box culvert into the east side of the proposed detention basin at the Encanto Municipal Golf Course.
- The proposed 72-inch storm drain parallels the existing 84-inch storm drain and transitions into a 12 foot by 4 foot box culvert which discharges directly into the proposed west detention basin at the Encanto Municipal Golf Course. At the transition structure, a low flow by-pass pipe will allow small flows to drain under the 54-inch sanitary sewer and into the by-pass pipe for the existing storm drain; thereby allowing low flows to continue south without inundating the golf course detention basin.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

15 th Avenue Storm Drain					Unit	Unit Price	Quantity	Amount
Item No.	Item Description							
1	54" SD in 15th Ave, Grand Canal to Highland STA. 4082+00 to STA. 4102+99	LF	\$680.99	2099	\$		1,429,407	
2	60" SD in 15th Ave, Indian School to Grand Canal STA. 4062+52 to STA. 4082+00	LF	\$744.75	1948	\$		1,450,769	
3	72" SD in 15th Ave, Osborn to Indian School STA. 4037+08 to STA. 4062+52	LF	\$869.15	2640	\$		2,294,558	
4	78" SD in 15th Ave, Encanto Golf Course to Osborn STA. 4000+00 to STA. 4037+08	LF	\$931.64	3708	\$		3,454,513	
5	66" SD Lateral in Indian School Rd., 18th Ave to 15th Ave	LF	\$806.66	1800	\$		1,451,995	
6	48" SD Lateral in Indian School Rd., 11th Ave to 15th Ave	LF	\$617.20	1400	\$		864,078	
7	54" SD Lateral in Osborn Rd., 18th Ave to 15th Ave	LF	\$680.99	1800	\$		1,225,790	
8	54" SD Lateral in Osborn Rd., 11th Ave to 15th Ave	LF	\$680.99	1400	\$		953,392	
9	36" SD Lateral in Thomas Rd., 18th Ave to 15th Ave	LF	\$479.85	800	\$		383,880	
10	54" SD Lateral in Thomas Rd., 8th Ave to 15th Ave	LF	\$680.99	2200	\$		1,498,187	
11	*48" SD Lateral in Bethany Home, 17th Ave to 15th Ave	LF	\$617.20	1200	\$		740,639	
12	*30" SD Lateral in Bethany Home, 8th Ave to 15th Ave	LF	\$420.11	2500	\$		1,050,265	
13	*48" SD Lateral in Missouri Ave., 18th Ave to 15th Ave	LF	\$617.20	1990	\$		1,228,226	
14	*42" SD Lateral in Missouri Ave., 11th Ave to 15th Ave	LF	\$555.02	1320	\$		732,624	
15	*42" SD Lateral in Camelback Rd., 11th Ave to 15th Ave	LF	\$555.02	1440	\$		799,226	
16	Utility Relocation - 12" Waterline STA. 3003+12 TO STA. 3030+00	LF	\$100.00	3730	\$		373,000	
	*Connect to existing 15th Avenue storm drain south of Palo Verde							
	Sub Total				\$		19,930,549	
	Contingencies (20%)				\$		3,986,110	
	TOTAL				\$		23,916,700	

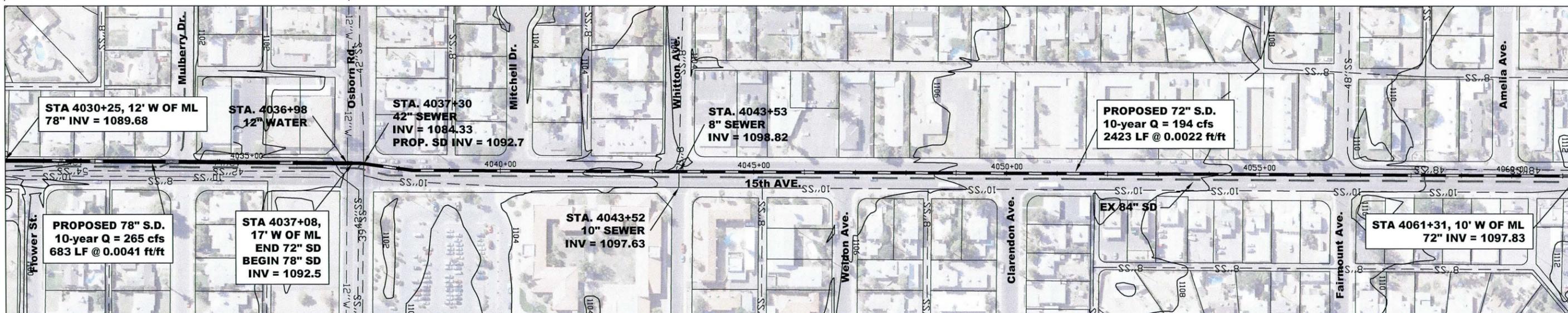
RELOCATE 12" W STA. 4000+00 to STA. 4037+30

ABANDON EXIST. 12" S.S.



MATCHLINE 4030+25 SEE BELOW

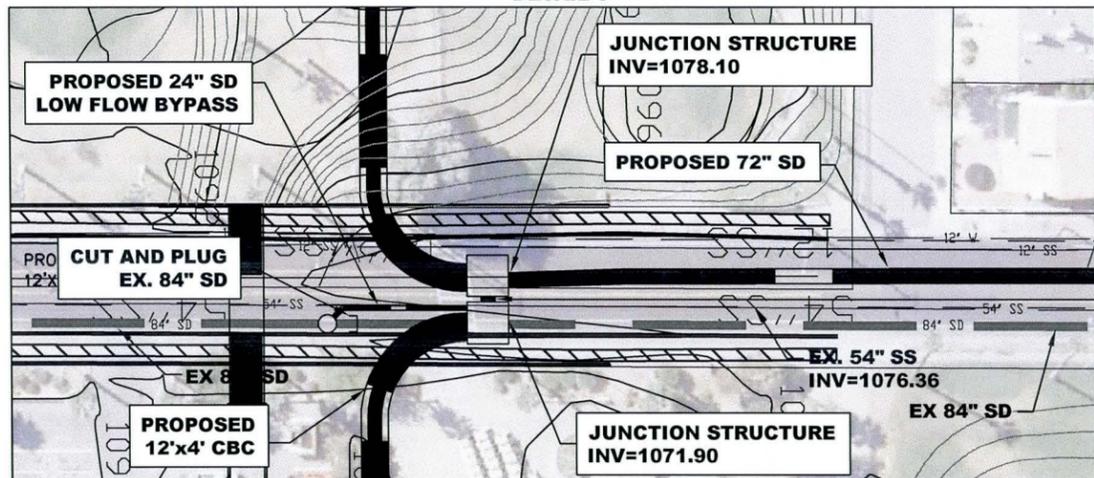
RELOCATE 12" W



MATCHLINE 4030+25 SEE ABOVE

MATCHLINE 4061+31 SEE SHEET 2

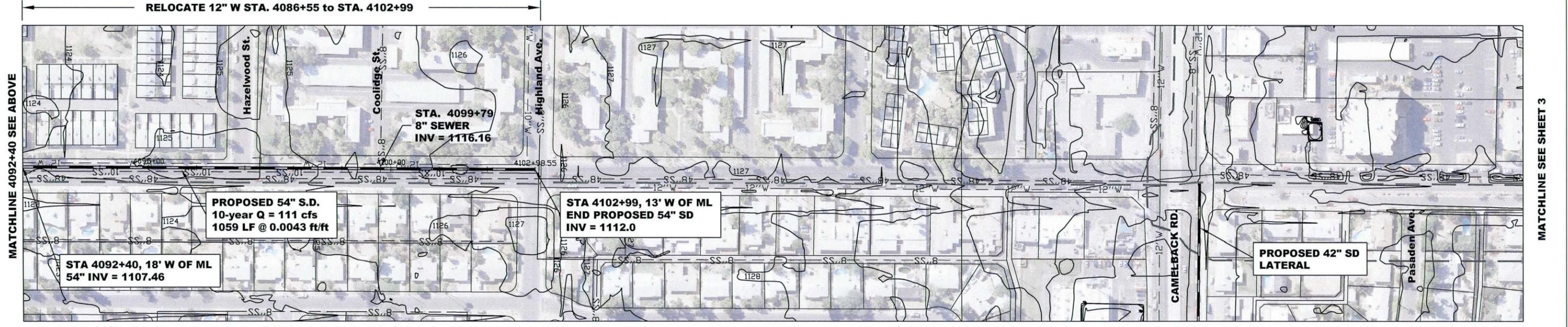
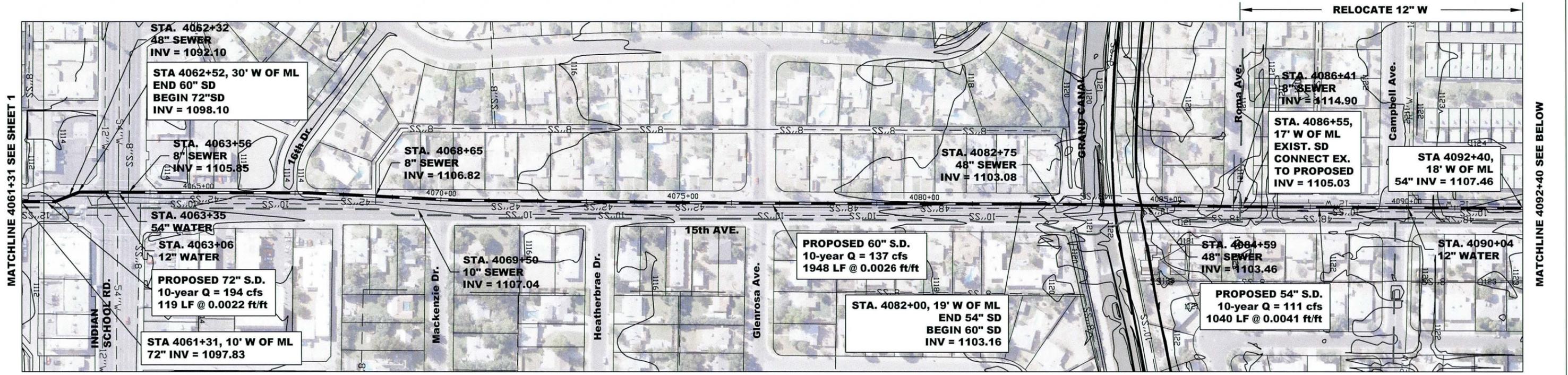
DETAIL 1



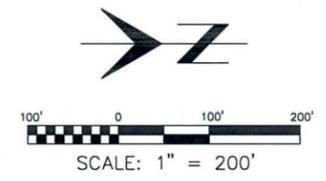
LOW-FLOW BYPASS PIPE UNDER 54" SS THAT ALLOWS SMALL FLOWS TO CONTINUE TO FLOW SOUTH IN THE EXISTING STORM DRAIN BYPASSING THE DETENTION BASIN



CAVE CREEK FLOODPLAIN			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP			
PROJECT CONTROL NO. FCD2004C040			
	BY	DATE	
DESIGNED	CTG	09/08	
DRAWN	KLH, SB	09/08	
CHECKED	LAV	09/08	
15TH AVE. (SOUTH) STORM DRAIN ENCANTO TO INDIAN SCHOOL RD			
PLAN SHEET		SHEET OF	
4000+00 TO 4061+31		01 03	

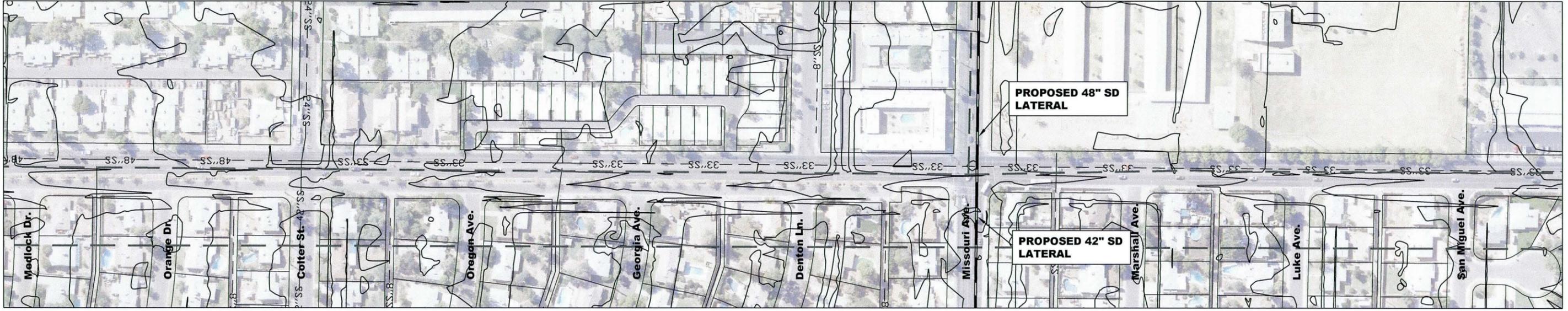


AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



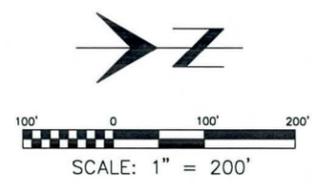
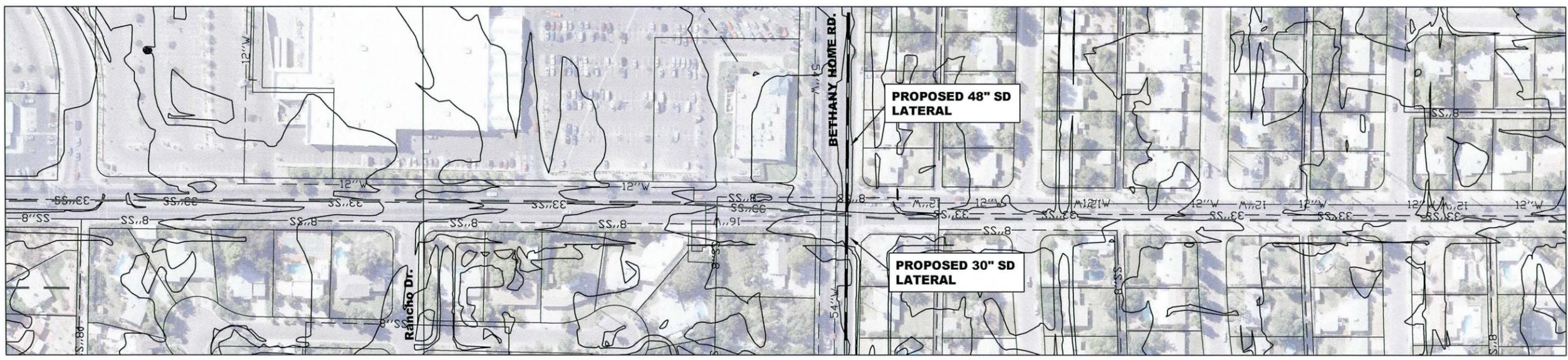
CAVE CREEK FLOODPLAIN			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP			
PROJECT CONTROL NO. FCD2004C040			
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	DATE 09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08
	15TH AVE. (SOUTH) STORM DRAIN INDIAN SCHOOL RD TO CAMELBACK RD		
		PLAN SHEET 4061+31 TO 4102+99	SHEET OF 02 03

MATCHLINE SEE SHEET 2



MATCHLINE SEE BELOW

MATCHLINE SEE ABOVE



CAVE CREEK FLOODPLAIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**
 METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

CONCEPT PLANS NOT FOR CONSTRUCTION

**15TH AVE. (SOUTH) STORM DRAIN
 INDIAN SCHOOL RD TO CAMELBACK RD**

ecc	PLAN SHEET	SHEET OF
	4061+31 TO 4102+99	03 03

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX H
ENCANTO GOLF COURSE

Storage at Encanto Municipal Golf Course – 10-year Detention Basin

The Encanto Municipal Golf Course is the proposed location for a new regional detention basin. The goal of the basin is to detain runoff from the contributing watershed, between Central Avenue and I-17 from the Arizona Canal to Thomas Road, with the basin sized for the 10-year flood (360 acre-feet). Stormwater stored in the detention basin is metered out (120 cfs) into the existing 19th Avenue, 15th Avenue, and 7th Avenue storm drains. The 19th and 15th Avenue storm drains ultimately outlet to the Salt River, and the 7th Avenue storm drain discharges to the ADOT tunnel system.

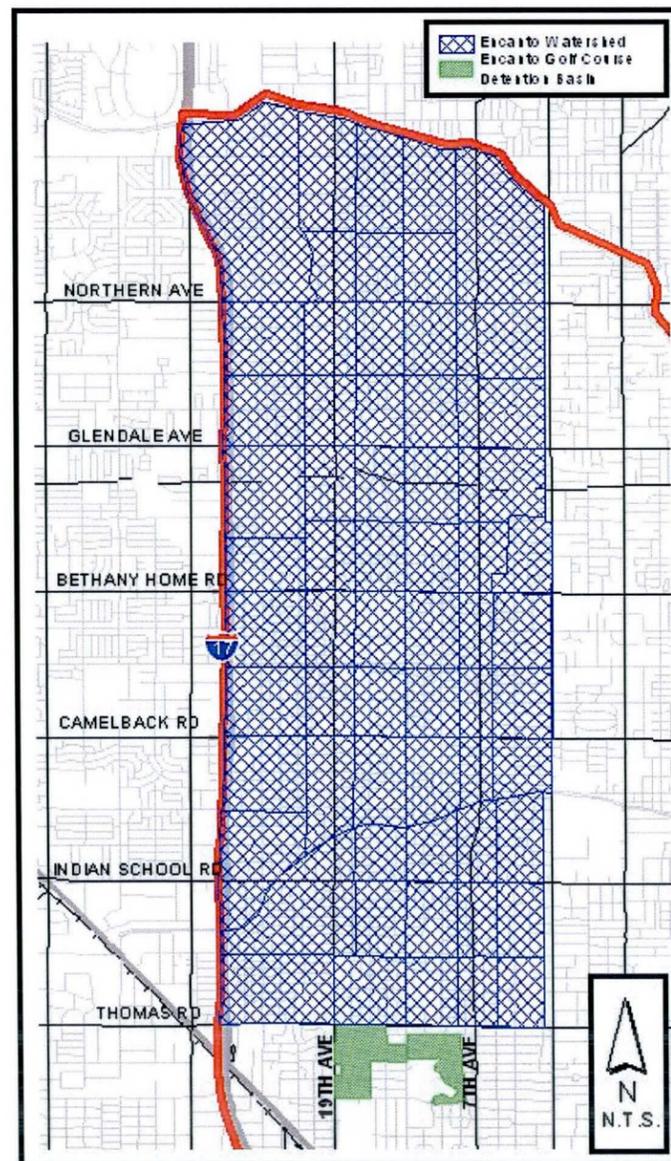
The Encanto Municipal Golf Course is ideally situated for a potential detention basin site because it lies in the low flow area of the Old Cave Creek Wash Floodplain. Therefore, surface flow naturally travels toward the proposed detention basin. The golf course would be lowered 5 to 15 feet below street levels, creating

contoured topography that will enhance the appearance of the course and make it more interesting to play. The parking lot, clubhouse, tee boxes and greens would be elevated so that they wouldn't be submerged during a flood event. The driving range and non-play areas would be the primary storage areas while the fairways would provide secondary storage. The fairways are purposely set 5 to 7 feet above the bottom of the primary storage areas so that they will only be inundated during very large storm events. The grading is designed with positive slopes so that the stored floodwater can migrate back out to the existing storm drains, without any low spots, thereby avoiding any long term ponding in the golf course.

Design Elements/Constraints

- The golf course detention basin shall be designed to maintain the 10-year volume of 360 acre-feet with a 1' of freeboard (420 acre-feet at a spill elevation of 1088.0'). The final design should input the new stage-storage-discharge relationship in the HEC-1 model to verify the results. The design presented in the recommended plan is only a concept. The final design could be done in any manner as long as the 10-year storage volume plus 1' of freeboard is met.
- The design is for the 10-year storm. Events larger than this will overtop the detention basin and return to the streets as surface flow.

- The clubhouse, parking lot, tee boxes and greens shall remain near street level, above the 10-year water surface elevation (1087.3).
- Fairways and cart path shall be elevated 5 to 7 feet above the bottom of the primary storage areas.
- The driving range and non-play areas will provide primary storage within the golf course and shall be graded with positive slope toward the basin outlet structures to avoid long term ponding on the golf course. These interior drainage culverts will provide connections between the primary storage areas (see plan sheets).
- There shall be low flow bypass structures included on all incoming storm drains to prevent the discharge of nuisance flows and small storms from entering the golf course.
- The junction structure at the 15th Avenue storm drains shall allow the bypass of low flows and shall be designed to reverse flow; allowing the golf course basin to drain back to the 15th Avenue storm drain.
- A golf cart underpass shall be provided under 15th Avenue that will provide the dual purpose of a grade separated crossing for golf carts as well as a basin equalization culvert. The east and west portions of the golf course basin have been modeled to function independently; each having enough capacity to store their respective watersheds. However, in the event of a spatially varied storm, where one side fills while the other is empty, the cart underpass will provide water level equalization at fairway elevation.
- There is also an SRP irrigation line and a private irrigation line that will need to be relocated within the proposed Encanto Golf Course Detention Basin.
- The storage volume provides a significant decrease in the flows downstream of the golf course. The concentrated flows are much lower than the existing condition surface flows (the decrease is from approximately 2000 cfs existing conditions to 1100 cfs proposed conditions). The existing 100-year flood depth of 0.65' at Encanto Boulevard is decreased to 0.37' with the proposed detention basin in place.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).



Cave Creek Recommended Drainage Plan – Social Considerations

Public comments indicated a high level of support for new storm drains and floodwater storage at Encanto golf course. Within the Cave Creek area, the recommended drainage plan incorporates new storm drains and floodwater storage at Encanto golf course. The suburban park landscape theme selected for the golf course is highly supported by the public.

Encanto Golf Course					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	Reconstruct Golf Course	EA	\$8,000,000.00	1	\$ 8,000,000
2	Excavation and Haul (12 mile Round Trip)	CY	\$13.00	1,430,000.00	\$ 18,590,000
3	Cart Underpass at 15th Avenue, 12' x 8' CBC	LF	\$2,259.60	300	\$ 677,881
4	Elevate 15th Avenue	LF	\$500.00	480	\$ 240,000
5	Cart Path Retaining Walls	LF	\$62.85	840	\$ 52,794
6	Relocate Irrigation Pipe to Lake	LF	\$120.00	550	\$ 66,000
7	Relocate SRP Irrigation Pipe	LF	\$150.00	1800	\$ 270,000
8	12' x 4' CBC Interior Drainage	LF	\$1,610.89	1432	\$ 2,306,792
9	8' x 4' CBC Interior Drainage	LF	\$1,397.31	695	\$ 971,132
10	8' x 3' CBC Interior Drainage	LF	\$1,375.93	340	\$ 467,816
11	6' x 4' CBC Interior Drainage	LF	\$1,169.22	1254	\$ 1,466,197
12	48" SD Interior Drainage	LF	\$617.20	832	\$ 513,509
13	36" SD Outlets	LF	\$479.85	746	\$ 357,968
Sub Total					\$ 33,980,090
<i>Contingencies (20%)</i>					\$ 6,796,018
TOTAL					\$ 40,776,100

Encanto Golf Course LANDSCAPE DESIGN GUIDELINES

Proposed Retention Basin and Rehabilitated Golf Course

This recommended alternative provides multi-purpose opportunity that would improve both flooding issues, and recreation use. The reconstruction of the golf course would create a multi-use facility by providing floodwater storage, and by improving the course's golf marketing appeal and aesthetic qualities.

In conjunction with other storm drain improvements, as a floodwater storage facility, the golf course will reduce the frequency of flooding by increasing the capacity of the local drainage system from a 2-year system to a 10-year system. The golf course will provide 400 ac-ft of storm water storage by lowering the fairways and non-play areas of the course in a tiering fashion approximately 5ft –15ft below street level. The design of the golf course/flood storage facility shall be sensitive to the historic nature of the existing golf course and surrounding neighborhoods.

Encanto Golf Course, built in 1935, is the third oldest course in Arizona and lies within the historic Encanto-Palmcroft Historic District. Although the course's historic nature and central Phoenix location are positive qualities, in terms of golf, the course's interest and physical conditions could be improved. The rehabilitation of the golf course should focus on its economic performance, while preserving or improving the quality of its existing assets. Compared to newer golf courses, Encanto lacks topographic variety and is not as desirable to many golfers. While the flat nature of the existing topography is well suited for the average golfer, a more challenging course would draw interest from a wider variety of golfers.

Landscape Design Theme

A Suburban Park Landscape Design Theme has been chosen for Encanto Golf Course to preserve its historic contextual landscape setting. The surrounding landscape setting consists of palms, mature trees, manicured lawns, and highly maintained historic neighborhoods. This theme is reinforced by the City of Phoenix Parks and Recreation Department's desire to preserve the turf park character for their parks that lie south of the Arizona Canal.

This theme consists of flood control structures that accentuate the natural topography and create landscape variety and visual interest. Surface treatments consist primarily of turf, with plant materials consisting of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space.

Landscape and Recreation Design Guidelines

During the ADMP study process, discussions with the stakeholders developed several recommendations and guidelines that shall be addressed during the design process for the rehabilitated golf course. Certainly, a golf course architect will need to be involved in this effort to insure that proper golf course design and construction requirements are achieved. In addition to typical golf course design elements, unique elements and considerations brought about from the multi-use flood storage requirements and the area's historic character will need to be addressed. The following are general design recommendations:

- Maintain the golf tees and greens at or above the 10-year flood level.
- Provide a soils management plan for the beneficial use of existing top soils.

- Provide gentle slopes, berming, and views into the course at the perimeter to maintain the existing landscape character of the neighborhood.
- The rehabilitated golf course should maintain its historic turf character, while striving to reduce water use. This could be done by eliminating turf in non-play areas that are not as visible from the surrounding neighborhoods.
- Coordinate with the City of Phoenix Historic Preservation Office in the earliest design phase to obtain feedback on the concept and input on the historic issues and design recommendations.
- New facilities, remodels or additions, should be compatible with the scale, massing, and architecture of the property and compatible with adjacent properties. Compatibility is achieved by maintaining the spectrum of materials historically present, corresponding to the pattern and unit size of the materials such as bricks, blocks, or siding, of existing historic structures or continuing the visual and tactile texture exhibited by historic materials. Color of exterior materials should be the same or a complementary hue of the color of the existing historic buildings exterior materials. These City Historic Preservation Office guidelines should also be applied to drainage structures, headwalls, railings, site walls, and site furniture that will be added to the course.
- A goal of the preliminary design of the golf course is to maintain mature trees. The golf course rehabilitation will still require the removal and/or salvage of numerous trees. A plant inventory will be required and the trees on the golf course will need to be evaluated in terms of historic significance, salvagability, maintenance, and overall suitability for the golf course character.
- The City Parks and Recreation Department's policy regarding tree removal and replacement for canopy replacement equivalency shall be reviewed.
- Evaluate and provide for accessibility within the golf course. New golf course designs are required to provide reasonable accommodations for disabled individuals. The ADA Accessibility Guidelines (ADAAG) is the standard for complying with the ADA. Although this will not be a typical golf course design because of the flood water storage function, access accommodations should be considered and reviewed for compliance.
- In combination with city zoning requirements, provide a typical 20-40 foot variable width setback from property lines and roadways to help provide a visual transition to the basins with surrounding streetscape and residential properties. Emphasis should be placed on providing the widest possible setback adjacent to residential properties with a minimum setback being 10 feet.
- The overall configuration of the basins should be irregular and free-form.
- The design and functionality of the driving range is important due to the large amount of revenue it generates. Alternative surfacing and subsurface drainage concepts should be considered to reduce down time as much as possible, such as artificial turf and subsurface drainage rock.
- The drain time is a concern due to the loss of revenue when the course is shut down. The idea of a gate valve may be added to drain the course more quickly, but FCD/COP would need to work out a plan for this in final design,
- Side slopes must be graded to allow for mowing.
- Cart paths should run the entire length of the course in order to have the control of requiring carts to stay on the path when the course is wet.

Encanto Golf Course Recommended Plant Palette*(Plant varieties existing on the course shown in italics)*Trees

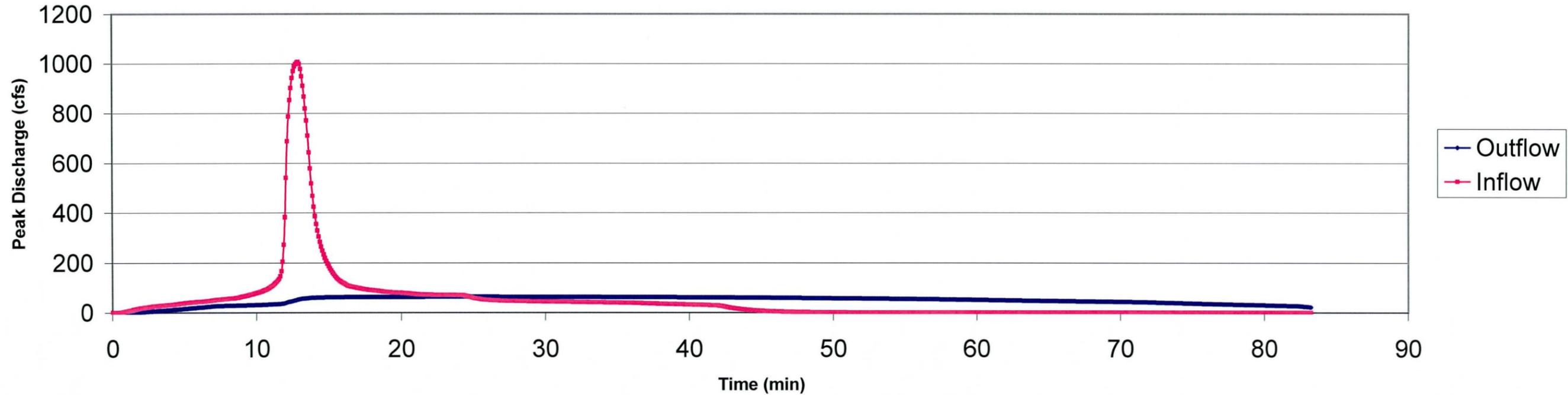
<u>Botanical Name</u>	<u>Common Name</u>
<i>Eucalyptus var.</i>	<i>Eucalyptus</i>
<i>Washingtonia robusta</i>	<i>Mexican Fan Palm</i>
<i>Washingtonia filifera</i>	<i>California Fan Palm</i>
<i>Phoenix dactylifera</i>	<i>Date Palm</i>
<i>Vitex angus-castus</i>	<i>Chaste Tree</i>
<i>Olea europia</i>	<i>Olive fruitless var.</i>
<i>Pinus halepensis</i>	<i>Aleppo Pine</i>
<i>Pinus elderica</i>	<i>Mondel Pine</i>
<i>Rhus lancea</i>	<i>African Sumac</i>
Acacia aneura	Mulga
Dalbergia sissoo	Sissoo
Quercus var.	Oak
Ulmus parviflora	Chinese Evergreen Elm
Fraxinus var.	Ash

Shrubs

<u>Botanical Name</u>	<u>Common Name</u>
<i>Nerium Oleander</i>	<i>White Oleander</i>
Leucophyllum var.	Sage
Nerium oleander petite	Petite Oleander
Caesalpinia pulcherrima	Red Bird of Paradise
Bougainvillea var.	Bougainvillea
Hesperaloe var.	Hesperaloe
Lantana var.	Lantana

Encanto (East) Detention Basin Calculation Summary

Encanto (East) 10-year Hydrograph



Stage-Storage-Discharge Summary

	0	10	40	98	125	155	187	Peak	221	250
Volume (acre-feet)	0	10	40	98	125	155	187	198.3	221	250
Elevation (feet)	1075	1078	1081	1084	1085	1086	1087	1087.33	1088	1089
Discharge (cfs)	0	27	42	54	57	60	63	64	66	2466

Note: Spills at 1088.

Stage/Volume versus Time

Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume
0	1075.0	0.0	22	1087.3	198.3	44	1086.0	155.0
2	1075.3	1.1	24	1087.3	198.3	46	1085.7	145.0
4	1076.2	4.1	26	1087.3	198.3	48	1085.3	135.0
6	1077.3	7.8	28	1087.0	187.0	50	1085.0	125.0
8	1078.2	12.0	30	1087.0	187.0	52	1084.7	116.0
10	1078.8	18.0	32	1087.0	187.0	54	1084.3	107.0
12	1080.2	32.0	34	1086.7	176.3	56	1084.0	98.0
14	1086.0	155.0	36	1086.7	176.3	58	1083.8	93.2
16	1086.7	176.3	38	1086.7	176.3	60	1083.2	83.5
18	1087.0	187.0	40	1086.3	165.7	62	1082.8	73.8
20	1087.0	187.0	42	1086.3	165.7	64	1082.5	69.0

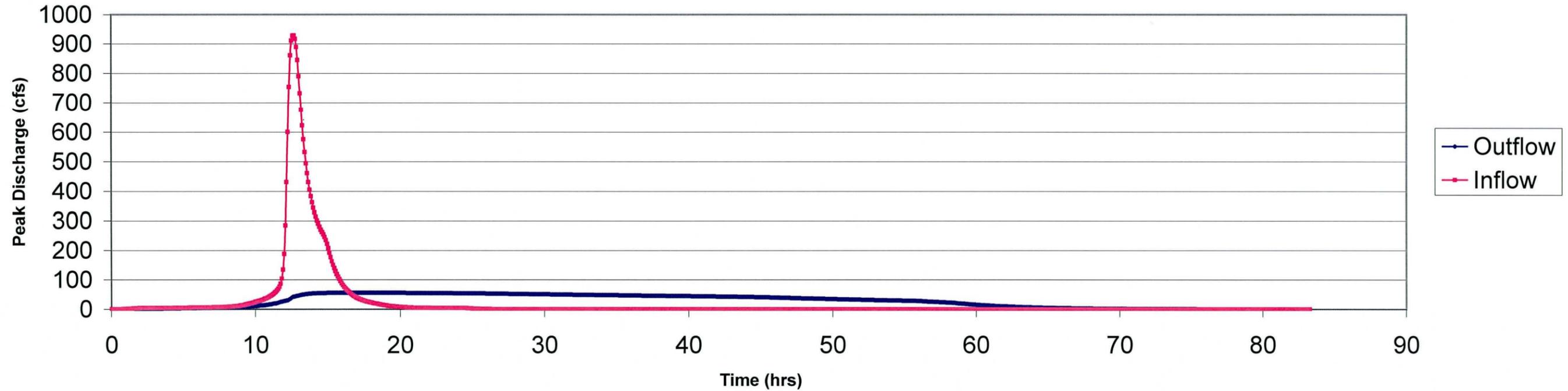
Note: Fairway elevation is 1083

Volume Calculation

Contour Elevation [ft]	Area [sq. ft.]	Area [acre]	Depth [feet]	Volume Provided [cu. ft.]	Accumulative Volume [cu. ft.]
1075	0	0.0	0	0.0	0.0
1076	63537	1.5	1	0.5	0.5
1077	212336	4.9	1	3.0	3.5
1078	336966	7.7	1	6.3	9.7
1079	412429	9.5	1	8.6	18.3
1080	461642	10.6	1	10.0	28.4
1081	513282	11.8	1	11.2	39.5
1082	653003	15.0	1	13.4	52.9
1083	1055753	24.2	1	19.4	72.3
1084	1149605	26.4	1	25.3	97.6
1085	1245465	28.6	1	27.5	125.1
1086	1343333	30.8	1	29.7	154.8
1087	1443209	33.1	1	32.0	186.8
1088	1543107	35.4	1	34.3	221.1

Encanto (West) Detention Basin Calculation Summary

Encanto (West) 10-year Hydrograph



Stage-Storage-Discharge Summary

	Peak									
Volume (acre-feet)	0	10	46	122	161	161	204	252	300	325
Elevation (feet)	1075	1078	1081	1084	1084.66	1085	1086	1087	1088	1089
Discharge (cfs)	0	27	42	54	56	57	60	63	66	2466

Note: Basin spills at elevation 1088 (overflow spills into 19th Avenue at Encanto Boulevard).

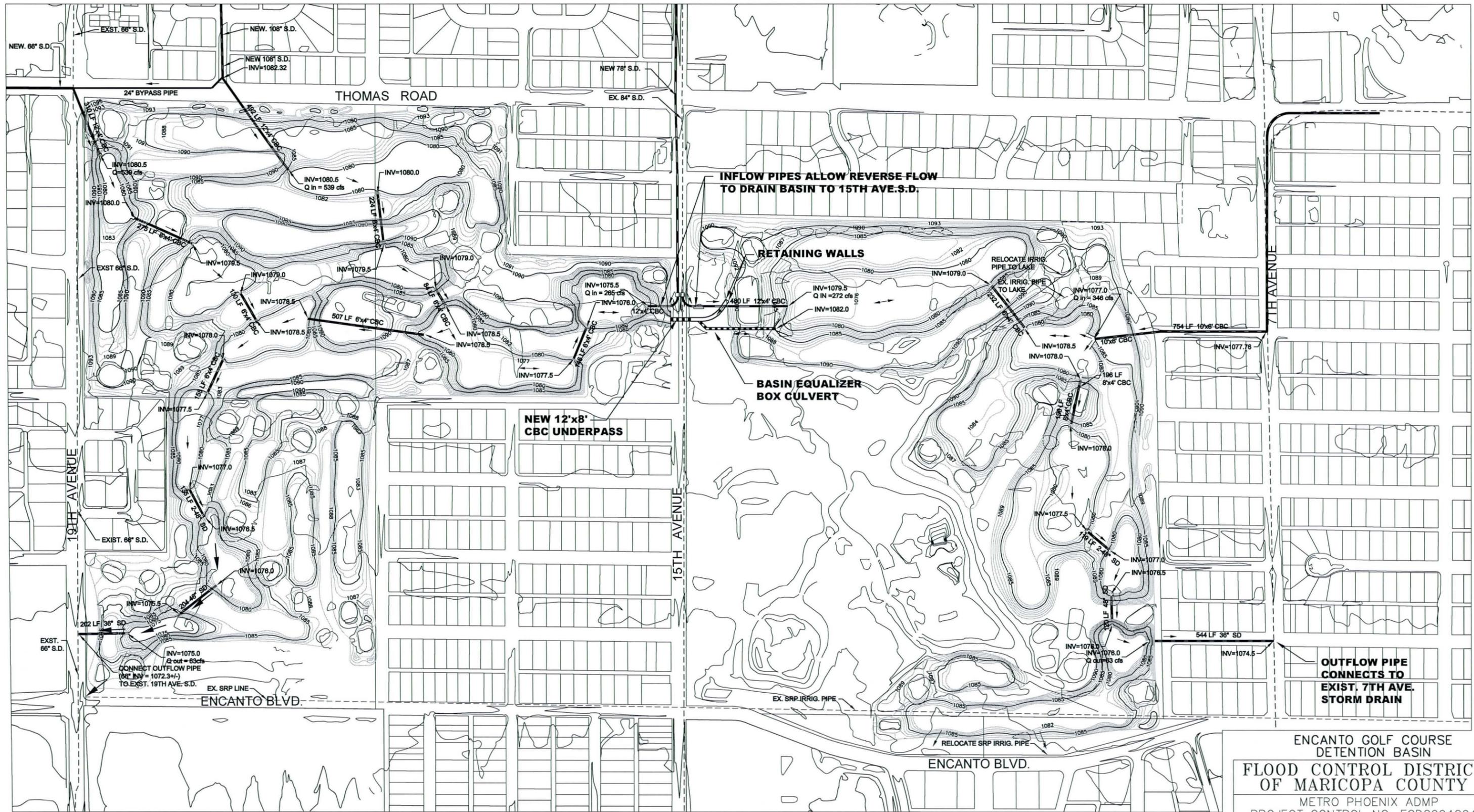
Stage/Volume versus Time

Time (hrs)	Stage	Volume	Stage	Volume	Time (hrs)	Stage	Volume
0	1075.0	0.0	13	1082.3	26	1083.8	115.7
1	1075.0	0.0	14	1084.0	27	1083.8	115.7
2	1075.1	0.4	15	1084.7	28	1083.5	109.3
3	1075.2	0.7	16	1084.7	29	1083.3	103.0
4	1075.3	1.1	17	1084.7	30	1083.3	103.0
5	1075.4	1.5	18	1084.7	31	1083.0	96.7
6	1075.6	1.9	19	1084.7	32	1082.8	90.3
7	1075.7	2.2	20	1084.7	33	1082.8	90.3
8	1075.8	2.6	21	1084.3	34	1082.5	84.0
9	1075.9	3.3	22	1084.3	35	1082.5	84.0
10	1076.2	4.1	23	1084.3	36	1082.3	77.7
11	1076.9	6.3	24	1084.0	37	1082.0	71.3
12	1078.2	12.4	25	1084.0	38	1082.0	71.3

Note: Fairway elevations are set at 1083 or higher.

Volume Calculation

Contour Elevation [ft]	Area [sq. ft.]	Area [acres]	Depth [feet]	Volume Provided [acre-feet]	Accumulative Volume [acre-feet]
1075	16278	0	0	0.0	0
1076	100587	2	1	1.2	1
1077	178286	4	1	3.2	4
1078	307595	7	1	5.5	10
1079	462280	11	1	8.8	19
1080	620602	14	1	12.4	31
1081	700603	16	1	15.2	46
1082	786249	18	1	17.1	63
1083	1411369	32	1	24.9	88
1084	1535493	35	1	33.8	122
1085	1829345	42	1	38.6	161
1086	1977596	45	1	43.7	204
1087	2179498	50	1	47.7	252
1088	2268906	52	1	51.1	303



INFLOW PIPES ALLOW REVERSE FLOW TO DRAIN BASIN TO 15TH AVE.S.D.

RETAINING WALLS

BASIN EQUALIZER BOX CULVERT

NEW 12'x8' CBC UNDERPASS

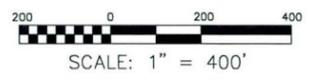
OUTFLOW PIPE CONNECTS TO EXIST. 7TH AVE. STORM DRAIN

ENCANTO GOLF COURSE
DETENTION BASIN
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

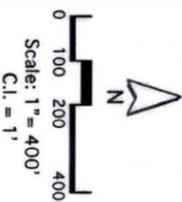
eec PLAN SHEET SHEET OF 01 01



AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



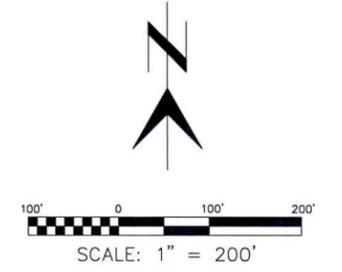
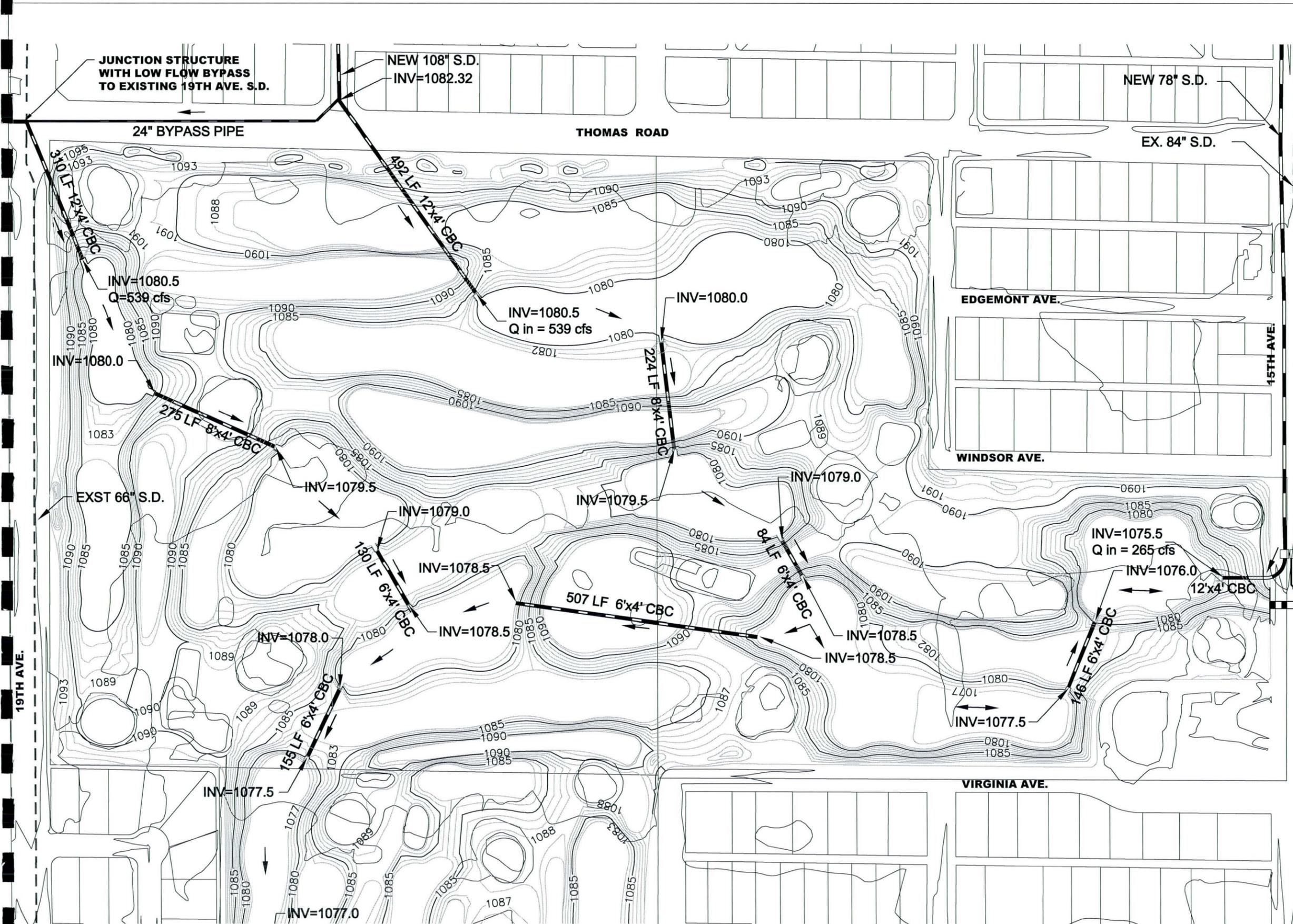
Metro Phoenix ADMP - Recommended Plan
Encanto Golf Course
 10-year Storage Basin/ Rehabilitated Golf Course
Concept Landscape Design




 Engineering and Environmental
 Consultants, Inc.
 7878 N. 18th Street, Suite 140
 Phoenix, Arizona 85020


 Goyan & Barker
 Inc.
 3030 N. Central Ave., Suite 1530
 Phoenix, Arizona 85012


 Flood Control District
 of Maricopa County

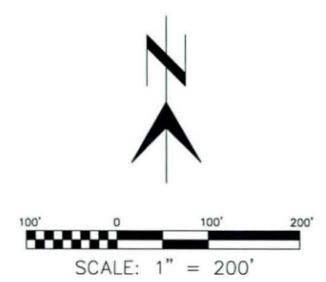
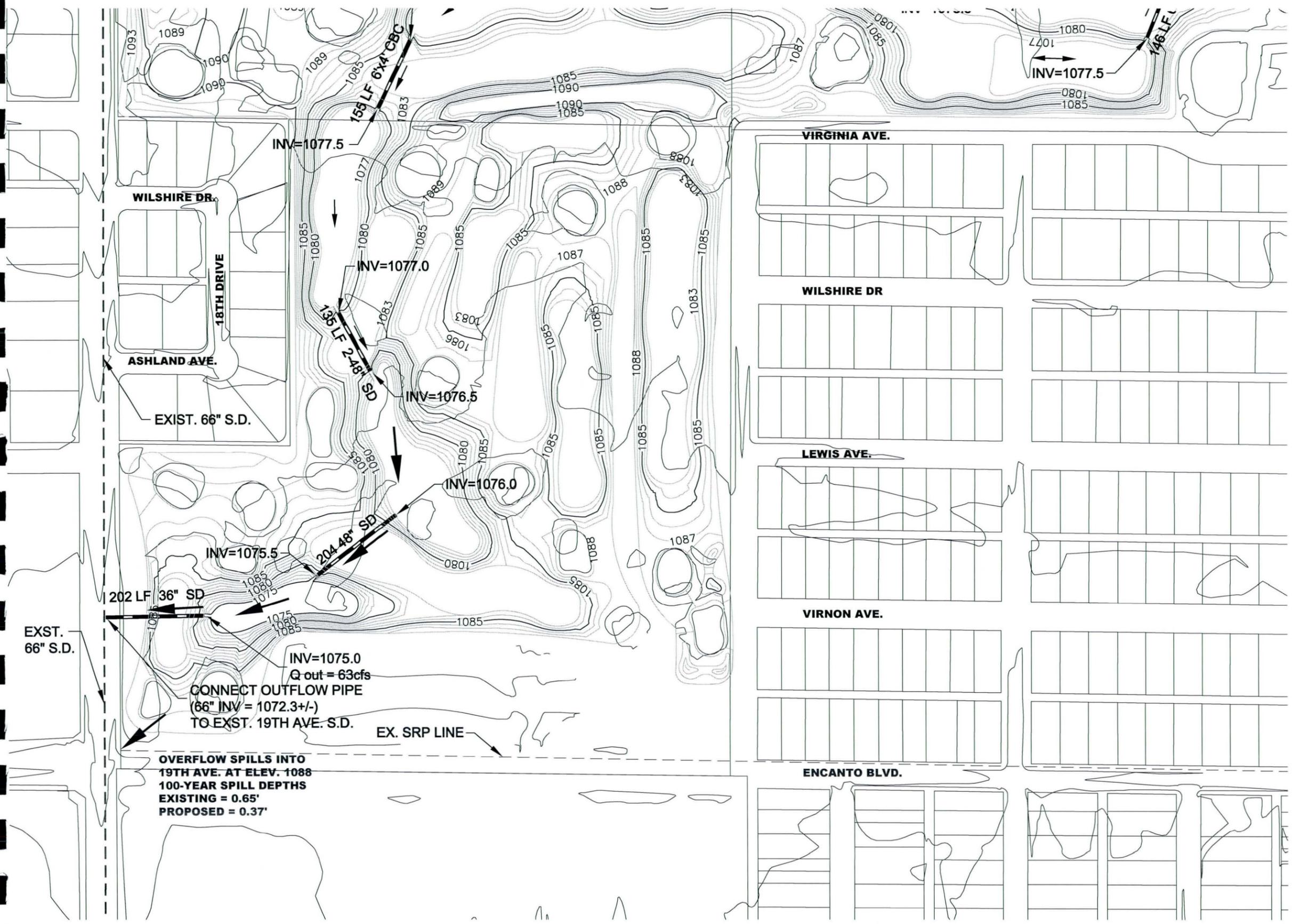


ENCANTO GOLF COURSE
DETENTION BASIN
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
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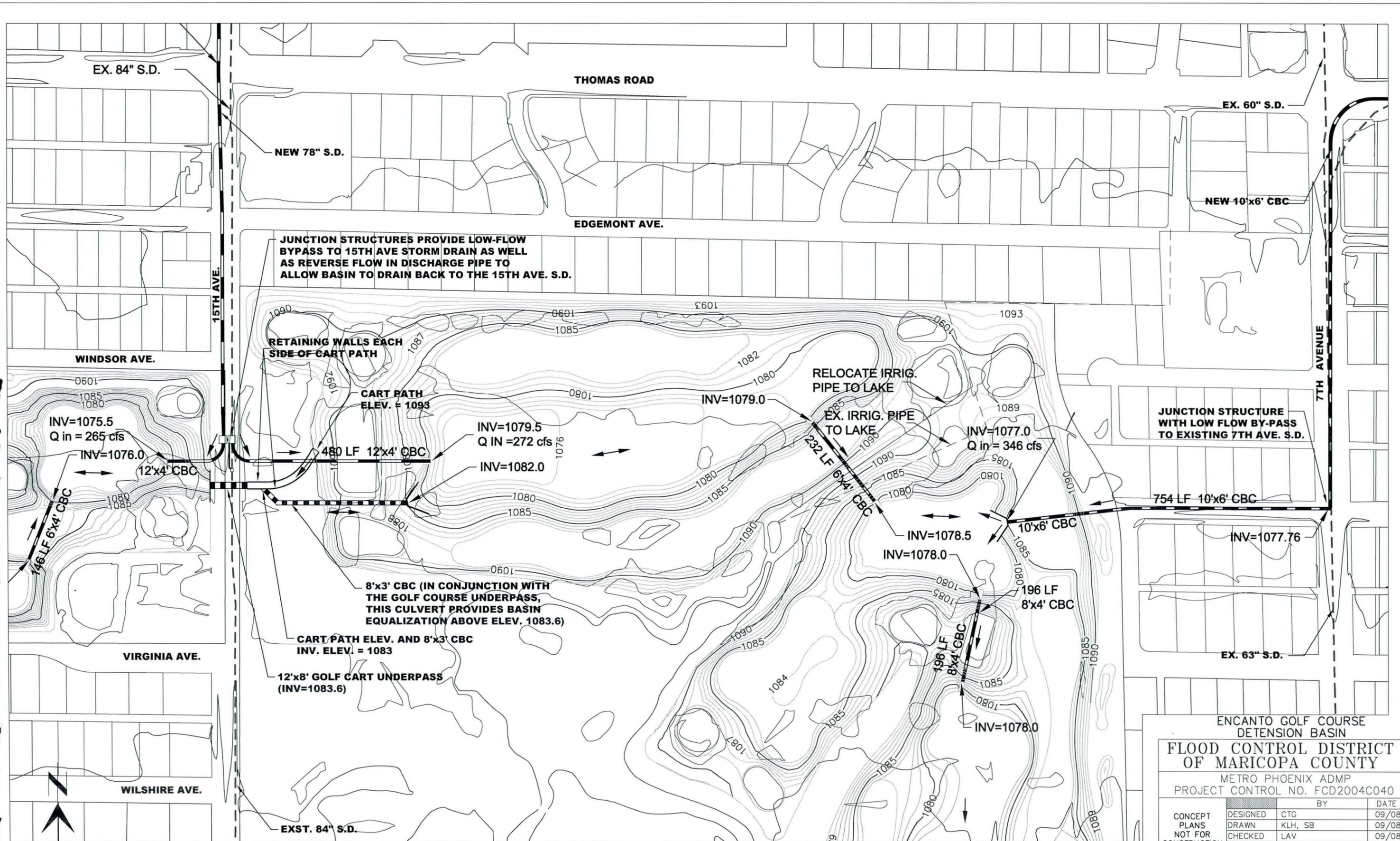


ENCANTO GOLF COURSE
 DETENTION BASIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	09/08
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JUNCTION STRUCTURES PROVIDE LOW-FLOW BYPASS TO 15TH AVE STORM DRAIN AS WELL AS REVERSE FLOW IN DISCHARGE PIPE TO ALLOW BASIN TO DRAIN BACK TO THE 15TH AVE. S.D.

RETAINING WALLS EACH SIDE OF CART PATH

CART PATH ELEV. = 1093

RELOCATE IRRIG. PIPE TO LAKE

JUNCTION STRUCTURE WITH LOW FLOW BY-PASS TO EXISTING 7TH AVE. S.D.

8'x3' CBC (IN CONJUNCTION WITH THE GOLF COURSE UNDERPASS, THIS CULVERT PROVIDES BASIN EQUALIZATION ABOVE ELEV. 1083.6)

CART PATH ELEV. AND 8'x3' CBC INV. ELEV. = 1083

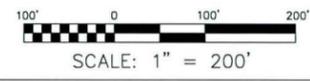
12'x8' GOLF CART UNDERPASS (INV=1083.6)

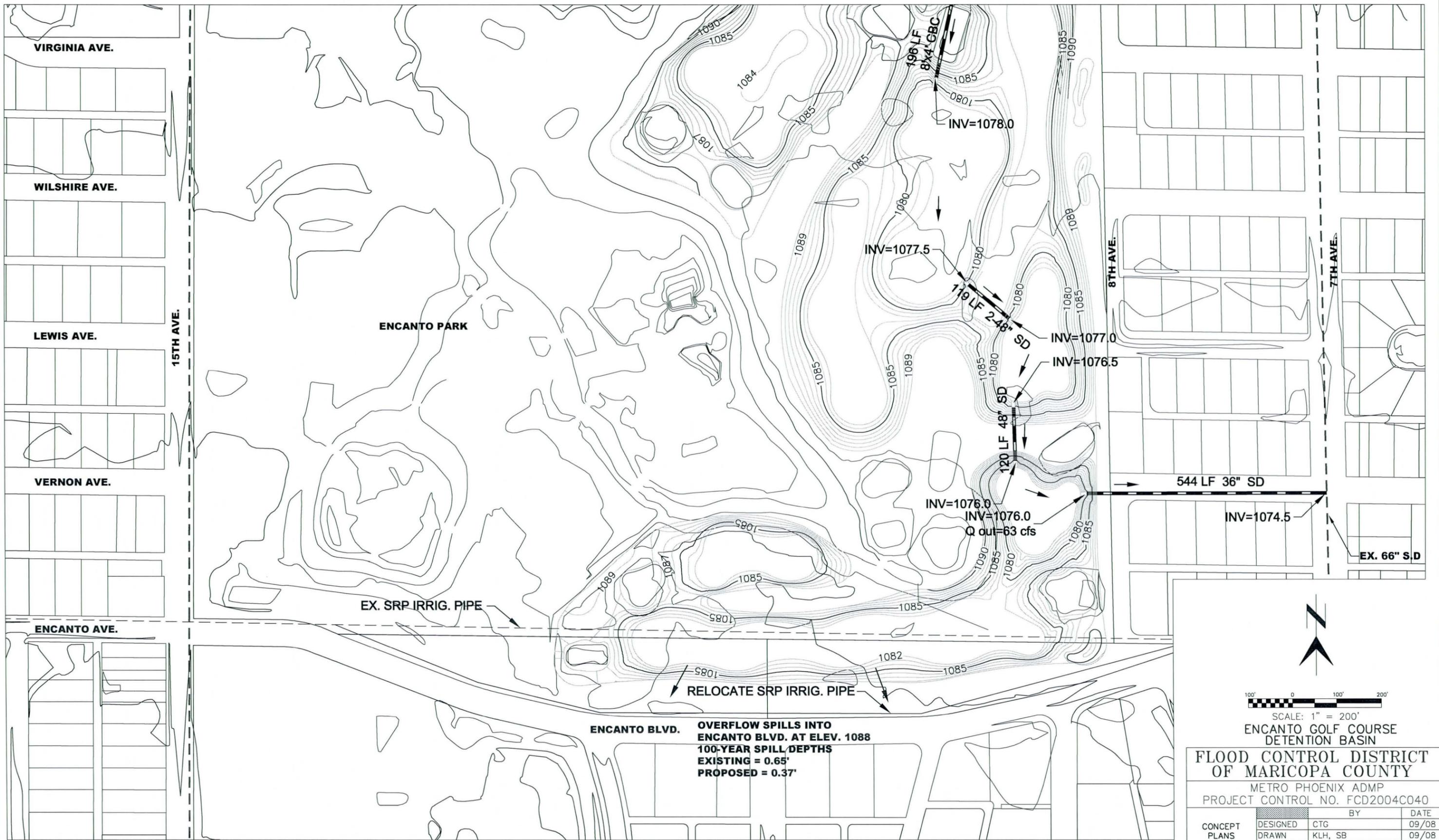
ENCANTO GOLF COURSE
DETENTION BASIN
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

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ENCANTO BLVD. OVERFLOW SPILLS INTO ENCANTO BLVD. AT ELEV. 1088
100-YEAR SPILL DEPTHS
EXISTING = 0.65'
PROPOSED = 0.37'



 SCALE: 1" = 200'
ENCANTO GOLF COURSE
DETENTION BASIN
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
 METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
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CHECKED	LAV	09/08


PLAN SHEET
SHEET OF
04 04



Existing Encanto Golf Course - 6th Hole



Proposed Retention Basin/ Rehabilitated Golf Course - 6th Hole



Existing Contours



Proposed Contouring

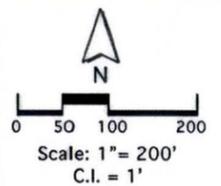


Engineering and Environmental
Consultants, Inc.
7878 N. 16th Street, Suite 140
Phoenix, Arizona 85020



Gavan & Barker, Inc.
3030 N. Central Ave., Suite 1530
Phoenix, Arizona 85012

Metro Phoenix ADMP - Recommended Plan
Encanto Golf Course
10-year Storage Basin/ Rehabilitated Golf Course
Simulation of New Contouring at 6th Hole

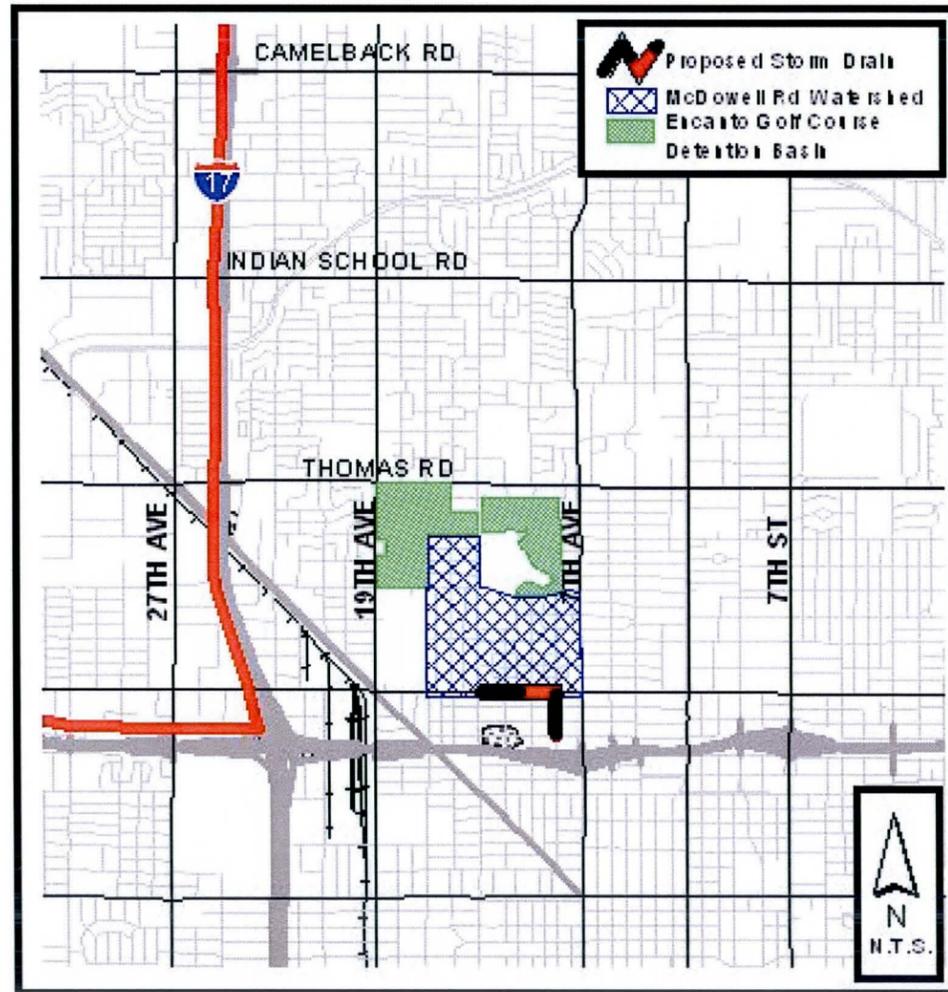


APPENDIX I
MCDOWELL ROAD STORM DRAIN
ADOT SWI to 15th Avenue

McDowell Road Storm Drain (15th Avenue to SWI) – 10 Year Storm Drain

The new McDowell Road storm drain diverts flow from the existing 15th Avenue storm drain to ADOT’s Storm Water Interceptor (SWI), an element of the ADOT’s overall drainage system. The McDowell Road storm drain has conveyance capacity for the 10-year runoff from the contributing watershed between 16th Avenue and 7th Avenue, from the Encanto Municipal Golf Course to McDowell Road.

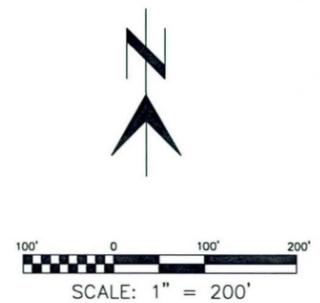
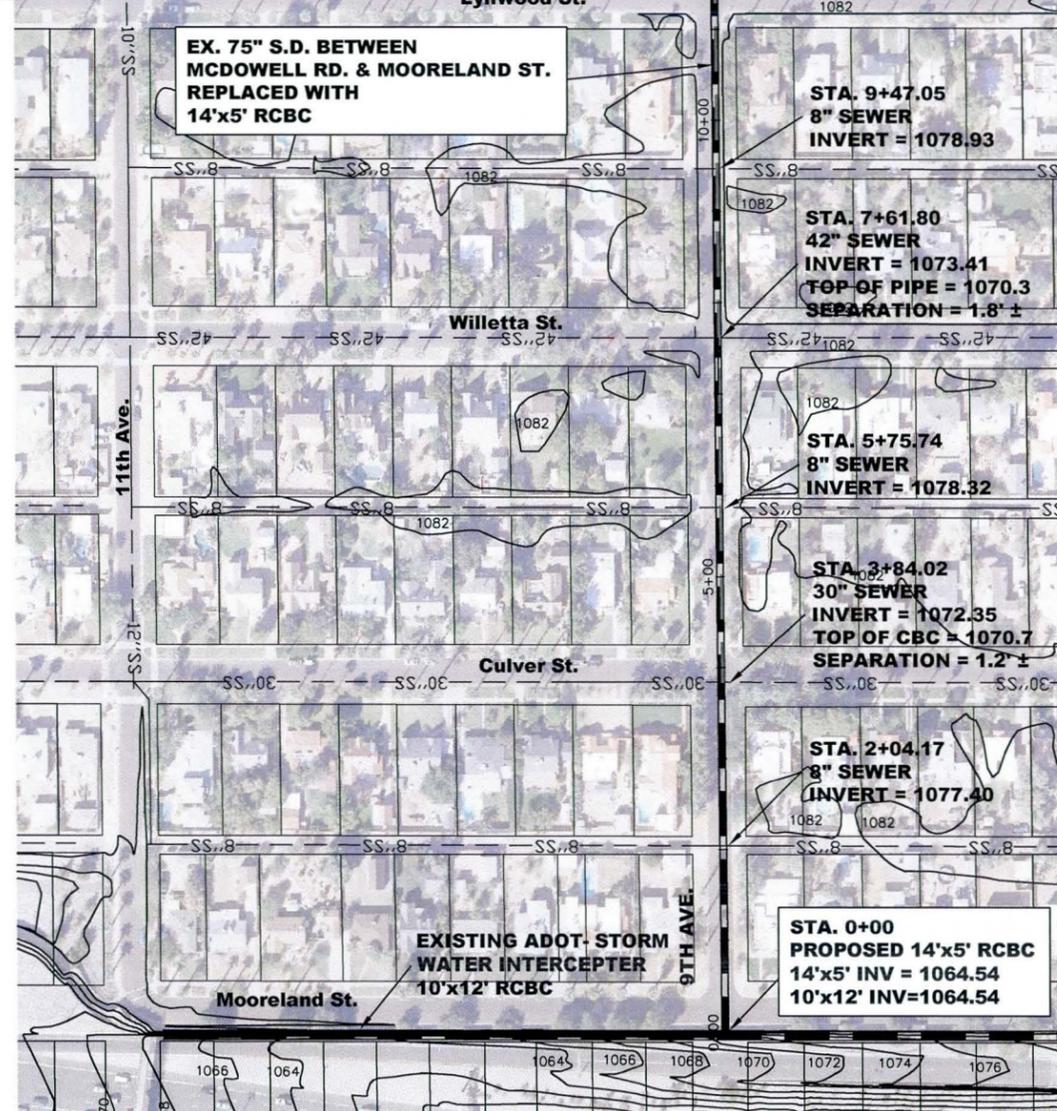
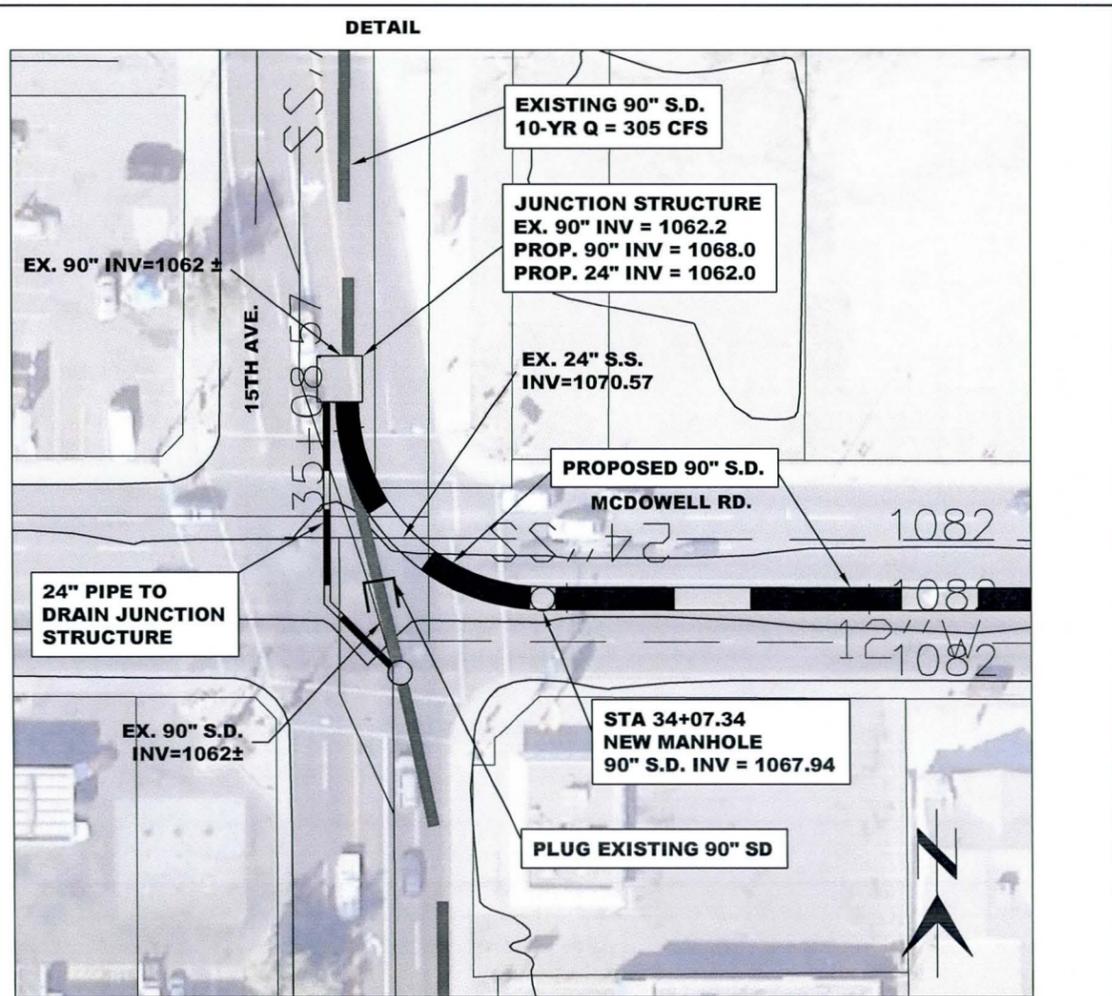
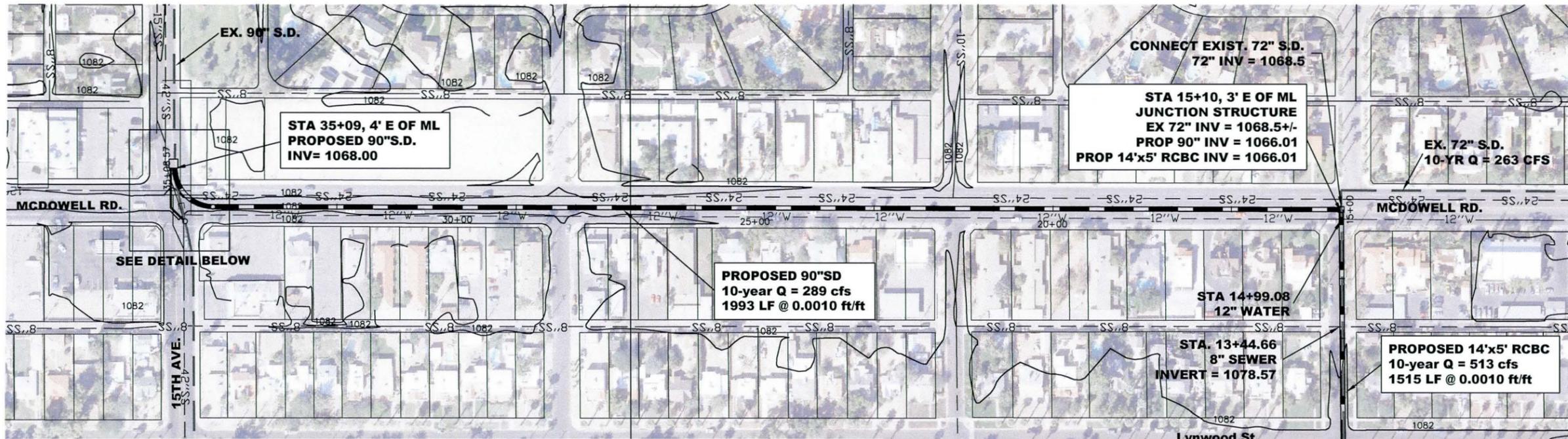
In order to provide 10-year protection south of I-10, the existing 15th Avenue storm drain will be connected to the proposed McDowell Road storm drain, cutting off and diverting all but the low flow which continues south in the existing 15th Avenue storm drain. The diverted flow is conveyed east in McDowell Road and then south in 9th Avenue until it discharges to the SWI. The proposed McDowell Road storm drain is designed to accept the low flow bypass at 15th Avenue and Thomas Road, the outfall of the western detention basin at the Encanto Municipal Golf Course, and the local drainage area between the golf course and McDowell Road.



Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- The proposed Encanto Golf Course Detention Basin needs to be constructed prior to the storm drain. If it is not, the storm drain will accept too much flow from the existing 15th Avenue storm drain and exceed the allowed capacity to the ADOT drainage system.
- Replace the 75-inch storm drain in 9th Avenue with a 14 foot by 5 foot concrete box culvert.
- The junction structure at 15th Avenue and McDowell Road will need to be designed in such a manner to allow the flow to “ramp up” from Elev. 1062 to Elev. 1068, without incurring significant head losses. A low flow pipe also needs to be provided for purposes of emptying the 15th Avenue storm drain after the large flows have passed.
- The outfall of the storm drain is ADOT’s storm water interceptor. The peak discharge at the outflow must remain at or below ADOT’s design flow of 510 cfs.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAR sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

McDowell Road Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	90" SD in McDowell Rd, 15th Ave to 9th Ave STA. 15+10 to STA. 35+09	LF	\$1,056.60	1999	\$ 2,112,139
2	14' x 5' CBC in 9th Ave, I-10 to McDowell STA. 0+00 to STA. 15+10	LF	\$1,731.26	1510	\$ 2,614,200
3	Junction Structure	EA	\$50,000.00	2	\$ 100,000
Sub Total					\$ 4,826,339
Contingencies (20%)					\$ 965,268
TOTAL					\$ 5,791,600



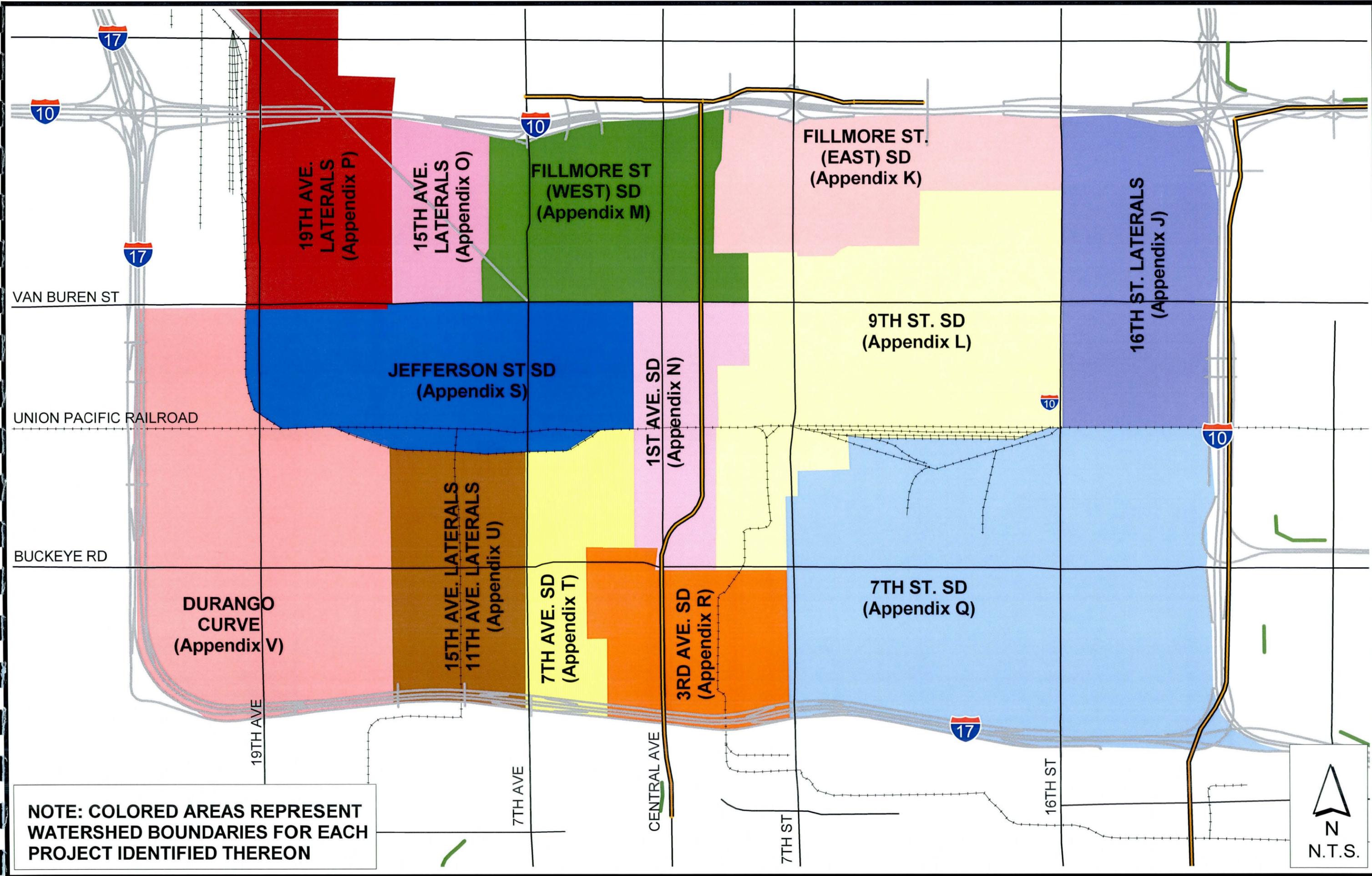
CAVE CREEK FLOODPLAIN
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**
 METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY DATE		
	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08
MCDOWELL RD STORM DRAIN ADOT SWI TO 15TH AVENUE.			
PLAN SHEET		SHEET OF	
STA. 0+00 TO STA. 35+09		01 01	

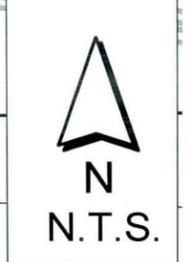
ecc

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

DOWNTOWN AREA



NOTE: COLORED AREAS REPRESENT WATERSHED BOUNDARIES FOR EACH PROJECT IDENTIFIED THEREON

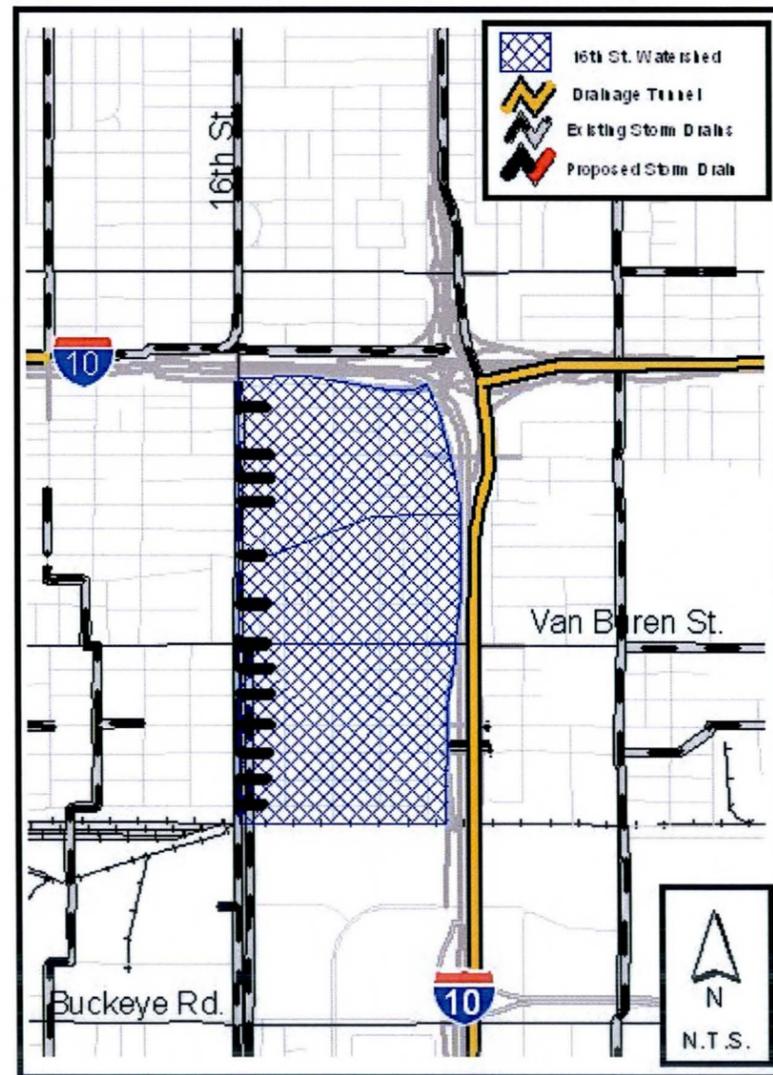


APPENDIX J
MODIFICATIONS TO 16TH STREET STORM DRAIN

Add Inlets to 16th Street Storm Drain, I-10 to Railroad – 10-year Storm Drain

The depressed section of I-10 cut off the existing 16th Street storm drain at the freeway leaving it with substantial capacity downstream of I-10. Connection of new storm drain inlets and laterals on the adjacent side streets will take advantage of the excess capacity in the existing 16th Street storm drain. The contributing watershed is the area west of I-10 over to 16th Street and from I-10 to the Union Pacific Railroad. The 16th Street storm drain ultimately discharges to the Salt River.

The existing 16th Street storm drain will have as many as thirteen new laterals on adjacent streets to the east. The purpose of the laterals and large inlets is to provide 10-year interception and conveyance of storm water for discharge into the existing 16th Street storm drain. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

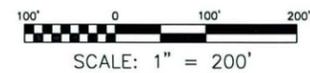
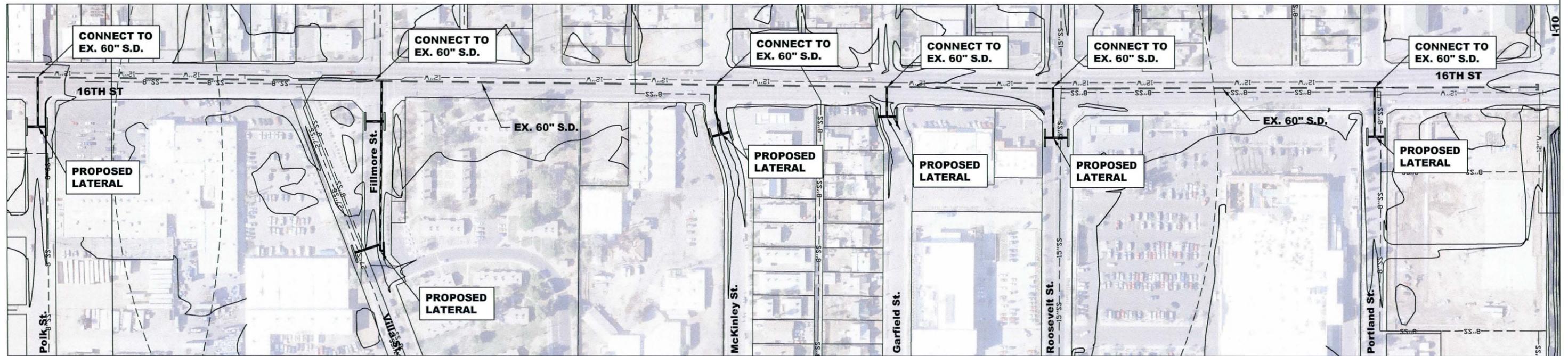
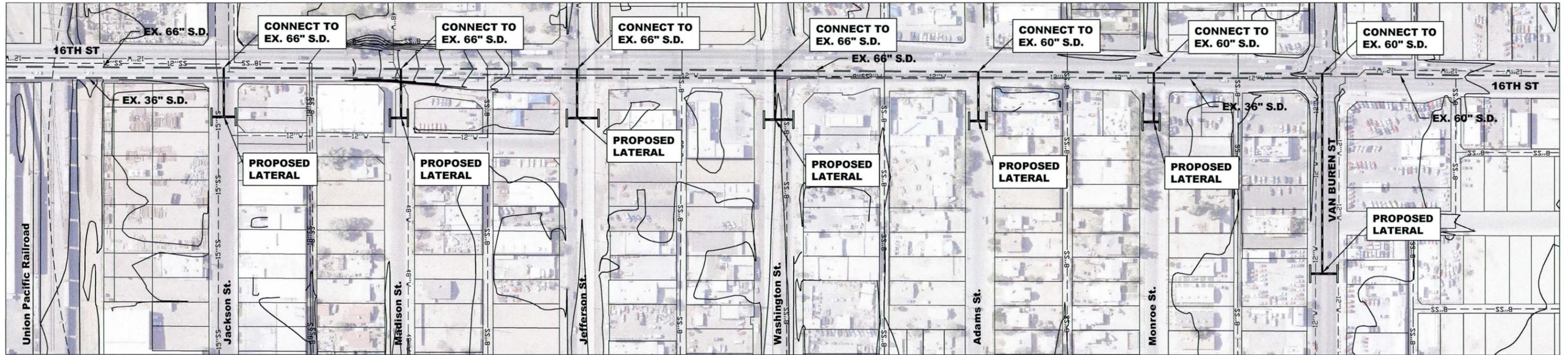


Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAc sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

16th Street Laterals					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	New Inlets on Existing 16th St. SD - Includes Connector Pipe	EA	\$10,000.00	28	\$ 280,000
2	New 30" Storm Drain Laterals on Existing 16th St. SD	LF	\$420.11	1850	\$ 777,196
Sub Total					\$ 1,057,196
Contingencies (20%)					\$ 211,439
TOTAL					\$ 1,268,600

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



DOWNTOWN AREA

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

**16TH STREET S.D. LATERALS
UPRR TO I-10**

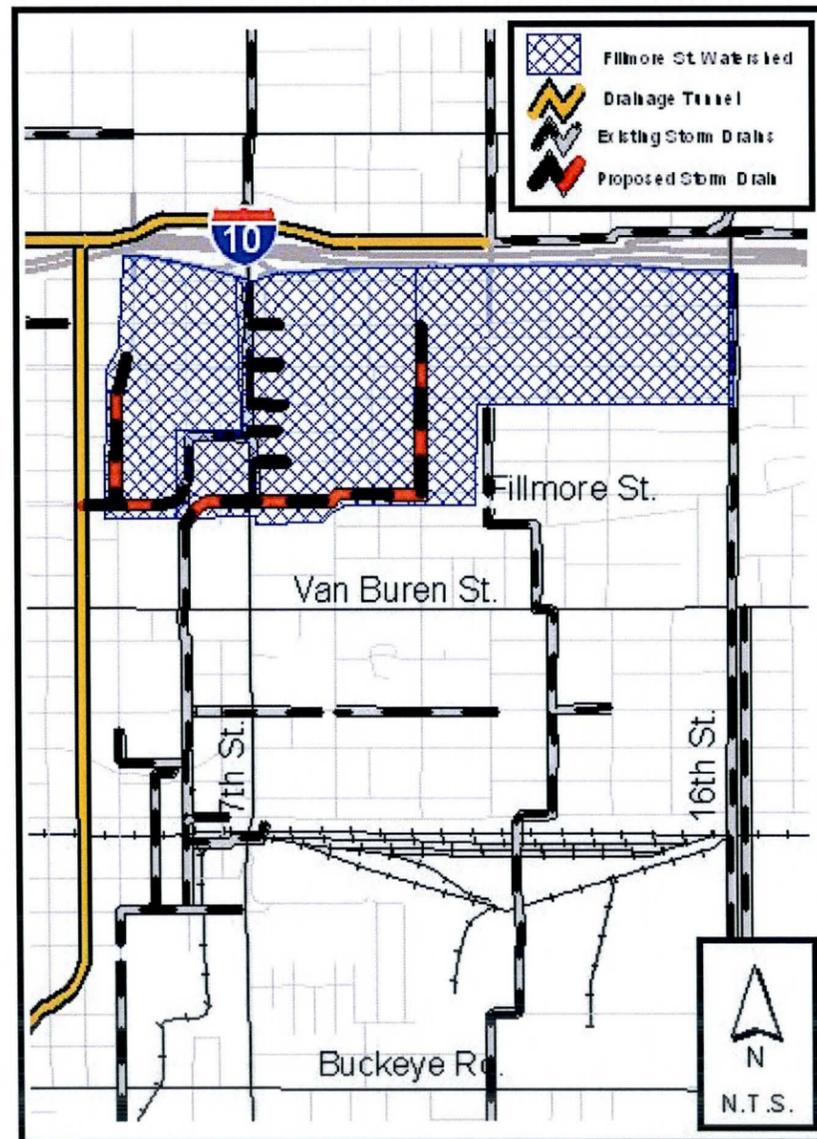
eec	PLAN SHEET	SHEET OF
		01 01

APPENDIX K
FILLMORE STREET (EAST) STORM DRAIN

Fillmore Street (East) Storm Drain, 11th Street to West Tunnel – 10-year Storm Drain

The proposed Fillmore Street (East) storm drain has two elements. The first element of the proposed Fillmore Street storm drain cuts off flows in the existing 4th Street storm drain and diverts the flows west in the proposed Fillmore Street storm drain until it ties into the ADOT tunnel at an existing 72-inch stubout. The second element begins at Portland Street and runs south in 11th Street to Fillmore street and heads west until it connects to the existing 81-inch storm drain which is cut off by the first element described above. The contributing watershed is from 2nd Street to 16th Street, between Fillmore St. and I-10 freeway.

This project includes a new 3rd Street lateral between Fillmore Street and Roosevelt Street. It also includes new inlets and laterals on the existing 7th Street storm drain between I-10 and Fillmore Street.



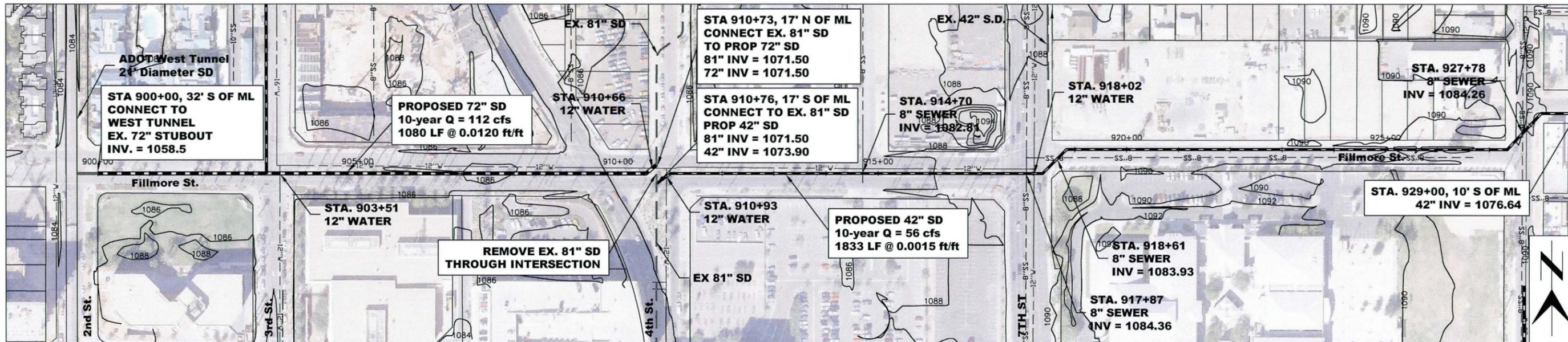
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Take advantage of the substantial capacity of the existing 7th Street storm drain by increasing storm water collection through adding new inlets and laterals.
- Outfall into ADOT’s West Tunnel via an existing 72-inch stubout. The Fillmore Street storm drain discharge into the west tunnel is 112 cfs.
- The peak discharge rate from the IGA between the City and ADOT is 140 cfs and should not be exceeded.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAP sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Fillmore Street Storm Drain (East)		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	36" SD in 11th St, Fillmore to Portland STA. 937+45 to STA. 956+16	LF	\$479.85	1871	\$ 897,800
2	42" SD in Fillmore, 4th St to 11th St STA. 910+70 to STA. 956+16	LF	\$555.02	4546	\$ 2,523,113
3	72" SD in Fillmore, West Tunnel to 4th Street STA. 900+00 to STA. 910+70	LF	\$869.15	1070	\$ 929,991
4	30" Storm Drain Lateral, 3rd Street	LF	\$420.11	1510	\$ 634,360
5	New Inlets on Existing 9th St. SD - Includes Connector Pipe	EA	\$10,000.00	10	\$ 100,000
6	New 30" Storm Drain Laterals on Existing 9th St. SD	LF	\$420.11	500	\$ 210,053
Sub Total					\$ 5,295,317
Contingencies (20%)					\$ 1,059,063
TOTAL					\$ 6,354,400

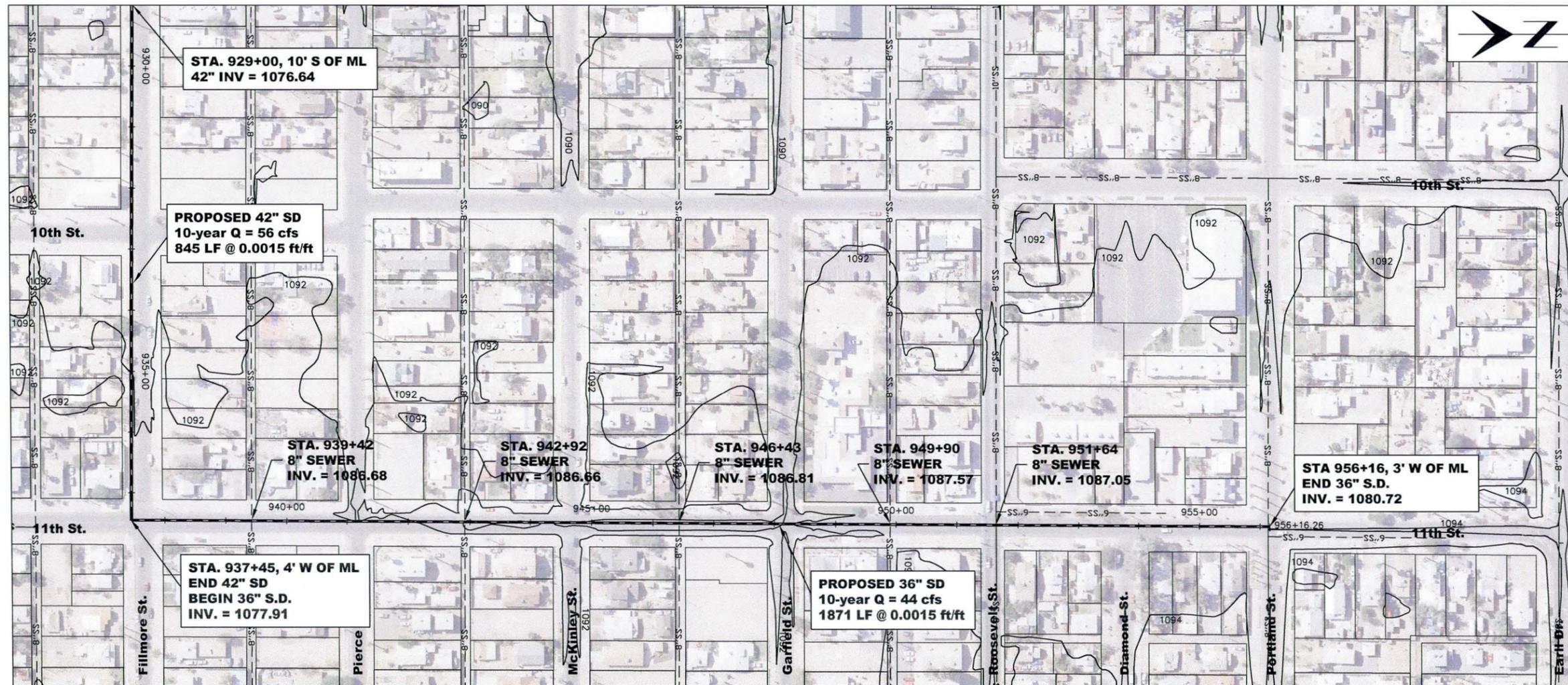
Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.

MATCHLINE SEE SHEET 2



MATCHLINE 929+00 SEE SHEET BELOW

MATCHLINE 929+00 SEE ABOVE



DOWNTOWN AREA

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

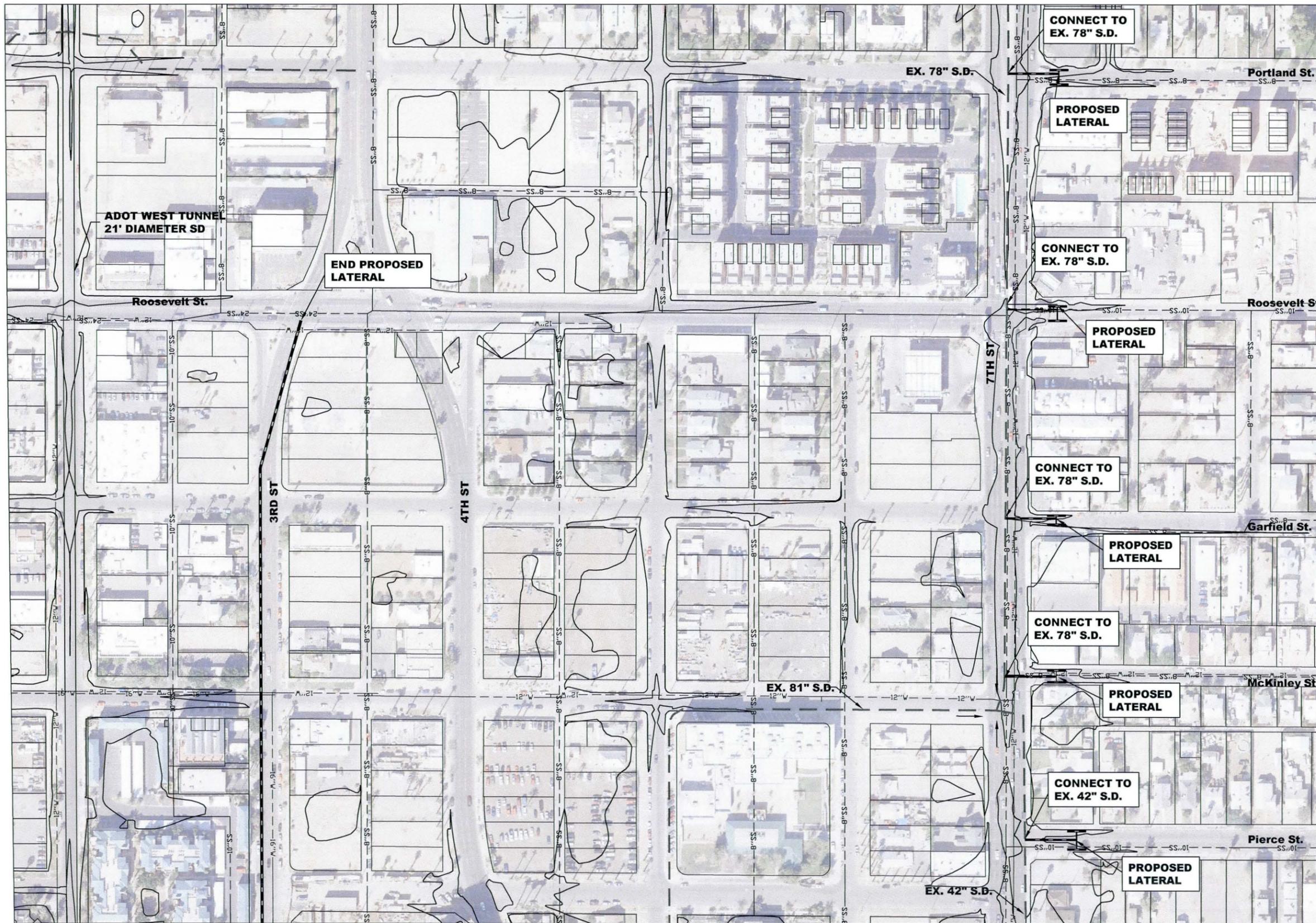
METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	DATE
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08

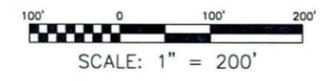
FILLMORE STREET (EAST) STORM DRAIN
2ND ST TO 11TH ST

eec	PLAN SHEET	SHEET OF
	STA. 900+00 TO STA. 956+16	01 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



MATCHLINE SEE SHEET 1



DOWNTOWN AREA

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

CONCEPT PLANS NOT FOR CONSTRUCTION	FILLMORE STREET (EAST) S.D. 3RD ST LATERAL	
	PLAN SHEET	SHEET OF 02 02



AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
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APPENDIX L
9TH STREET STORM DRAIN

9th Street Storm Drain, Van Buren to Grant – 10-year Storm Drain

The proposed 9th Street storm drain project is a combination of new and existing storm drains that provide a 10-year level of protection for a fairly large portion of the downtown area. The contributing watershed is between 2nd Street and 16th Street from approximately Fillmore Street to the Union Pacific Railroad.

The proposed 9th Street storm drain begins at Taylor Street north of Van Buren Street and runs south where it discharges to the existing Washington Street storm drain where it ultimately drains to the Salt River. Then, at 9th Street the upstream portion of the existing Washington Street storm drain is diverted south in the proposed 9th Street storm drain and flows under the Union Pacific Railroad west to 7th Street, continues south to Grant Street and west to 3rd Street. At 3rd Street it connects to the existing 3rd Street storm drain which ultimately outlets to the Salt River. Upstream of Grant Street, the existing 3rd Street storm drain is diverted to ADOT’s tunnel at Grant Street via an existing 78” stubout.

South of the Railroad, the proposed storm drain runs through a city-owned parking lot because it was assumed there would be no right of way acquisition required. The curved alignment through the parking lot employs fairly large radius curves to minimize head losses.

In order to utilize extra capacity of the 5th and 13th Street storm drains, additional components of this project include new storm drain inlets and laterals on the existing 5th Street and 13th Street storm drains between Fillmore Street and the Railroad.



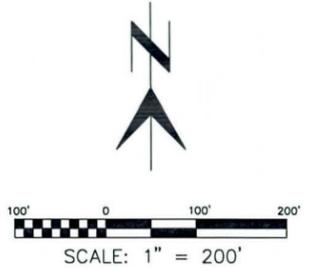
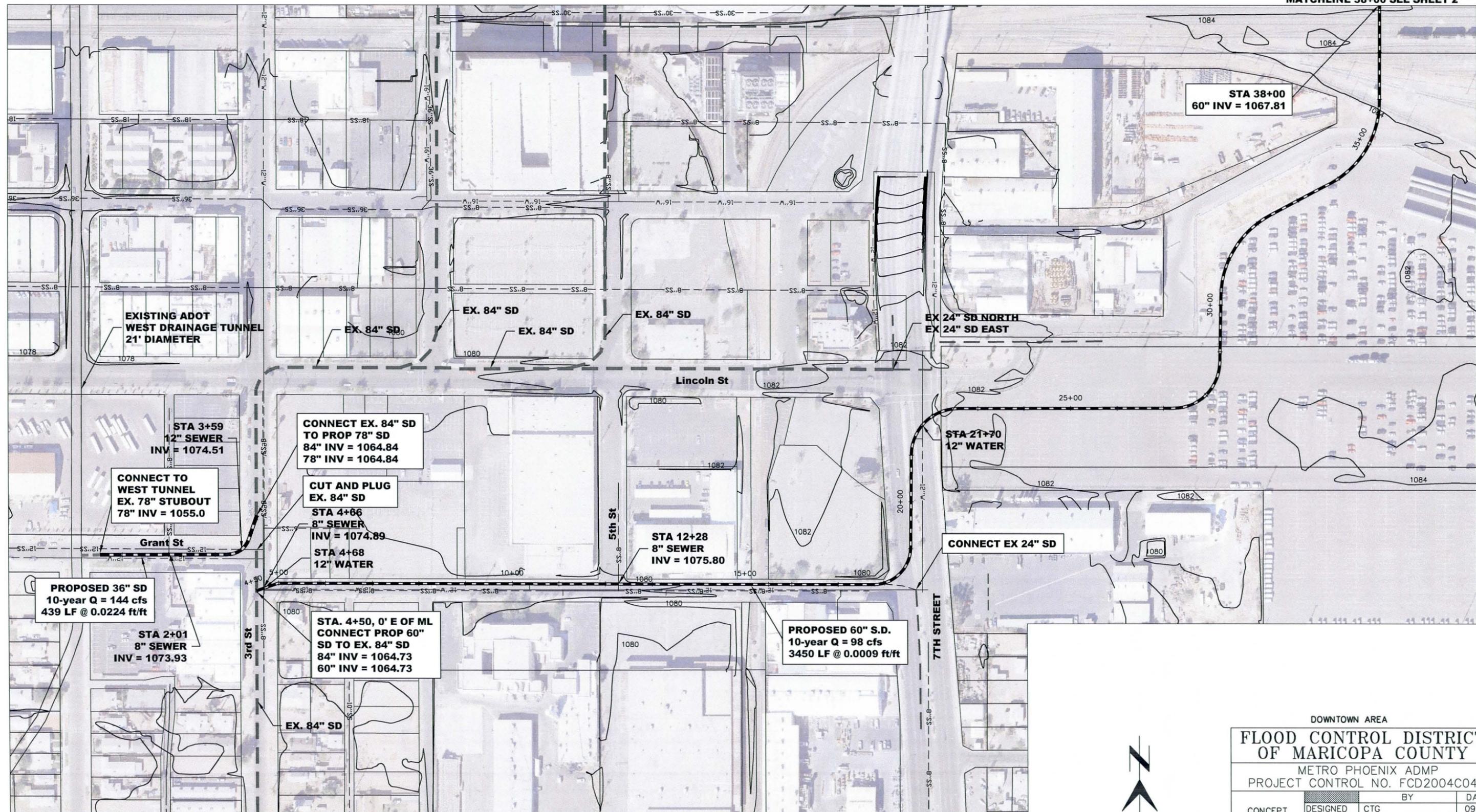
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Take advantage of the extra capacity of the existing 5th Street and 13th Street storm drains by increasing storm water collection through adding new inlets and laterals.
- Outfall into ADOT’s West Tunnel via an existing stubout at Grant Street. The storm drain discharge into the west tunnel is 144 cfs.
- The peak discharge rate from the IGA between the City and ADOT is 170 cfs and should not be exceeded.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAc sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

9th Street Storm Drain		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	36" SD in 9th St, Washington to Taylor STA. 52+50 to STA. 73+17	LF	\$479.85	2067	\$ 991,850
2	10' x 2' CBC in 9th St, Jackson to Washington STA. 40+06 to STA. 52+28	LF	\$744.75	1222	\$ 910,082
3	60" SD in Grant St, 3rd to Jackson/9th St STA. 4+50 to STA. 40+06	LF	\$744.75	3556	\$ 2,648,323
4	78" SD in Grant St, West Tunnel to 2nd St	LF	\$931.64	439	\$ 408,989
5	New Inlets on Existing 5th & 13th St. SD - Includes Connector Pipe	EA	\$10,000.00	22	\$ 220,000
6	New 30" Storm Drain Laterals on Existing 5th and 13th St. SD	LF	\$420.11	1350	\$ 567,143
7	Junction Structure	EA	\$50,000.00	2	\$ 100,000
Sub Total					\$ 5,846,387
Contingencies (20%)					\$ 1,169,277
TOTAL					\$ 7,015,700

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.

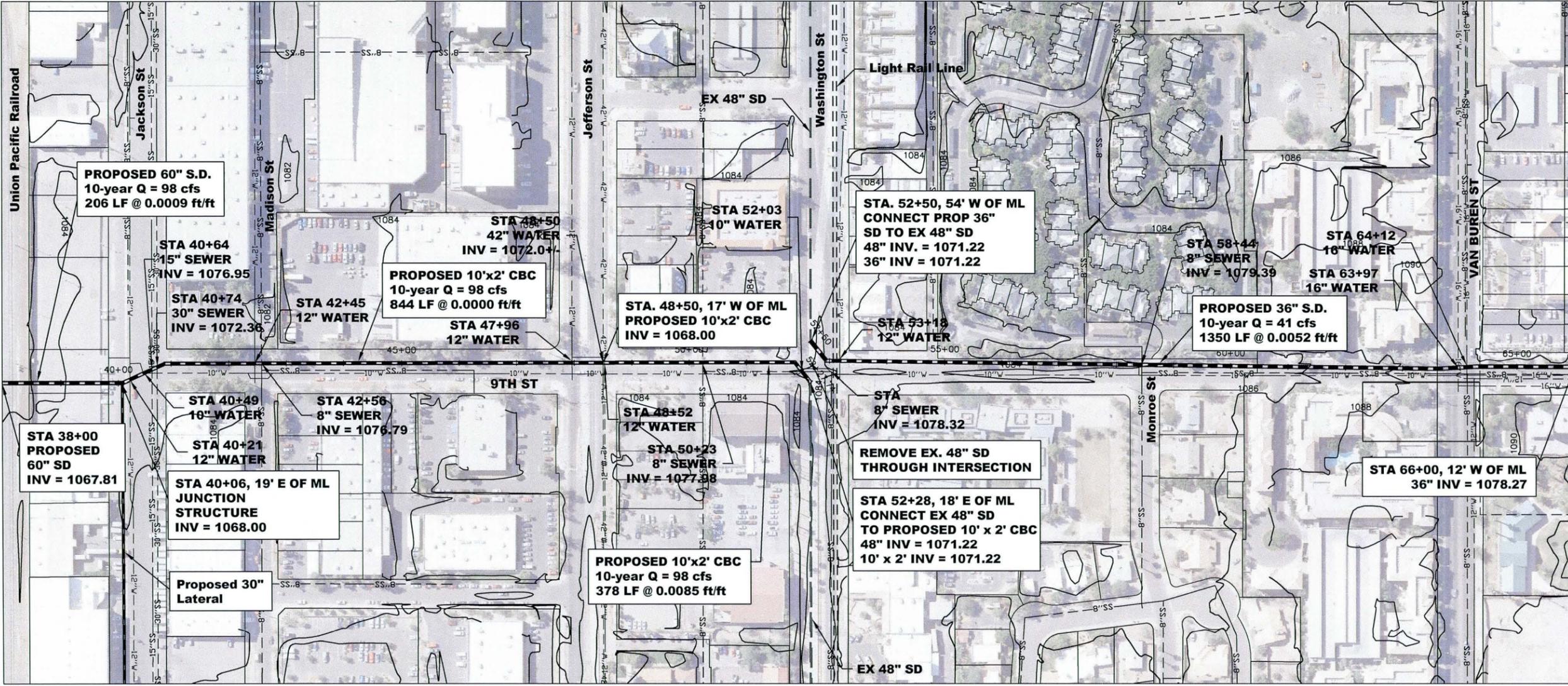
MATCHLINE 38+00 SEE SHEET 2



DOWNTOWN AREA			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP			
PROJECT CONTROL NO. FCD2004C040			
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08
9TH STREET STORM DRAIN TONTA ST TO TAYLOR ST			
PLAN SHEET		SHEET OF	
STA. 200+00 to STA. 200+00		01 03	

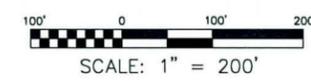
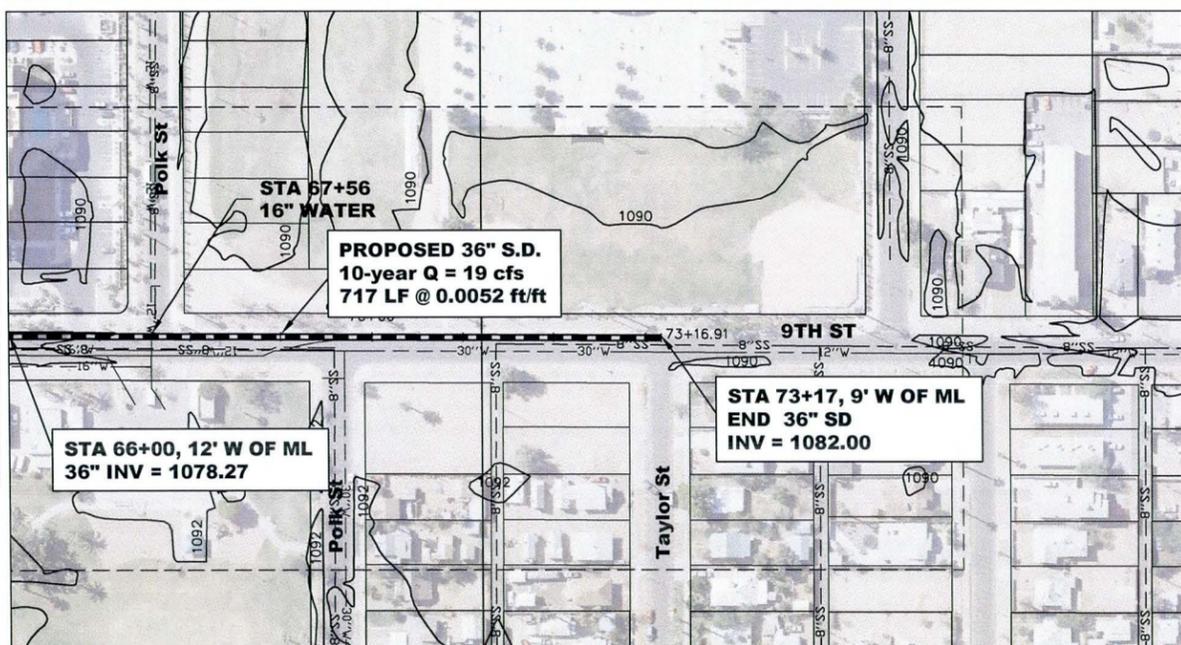
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 38+00 SEE SHEET 1



MATCHLINE 66+00 SEE BELOW

MATCHLINE 66+00 SEE ABOVE



DOWNTOWN AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

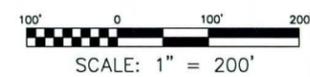
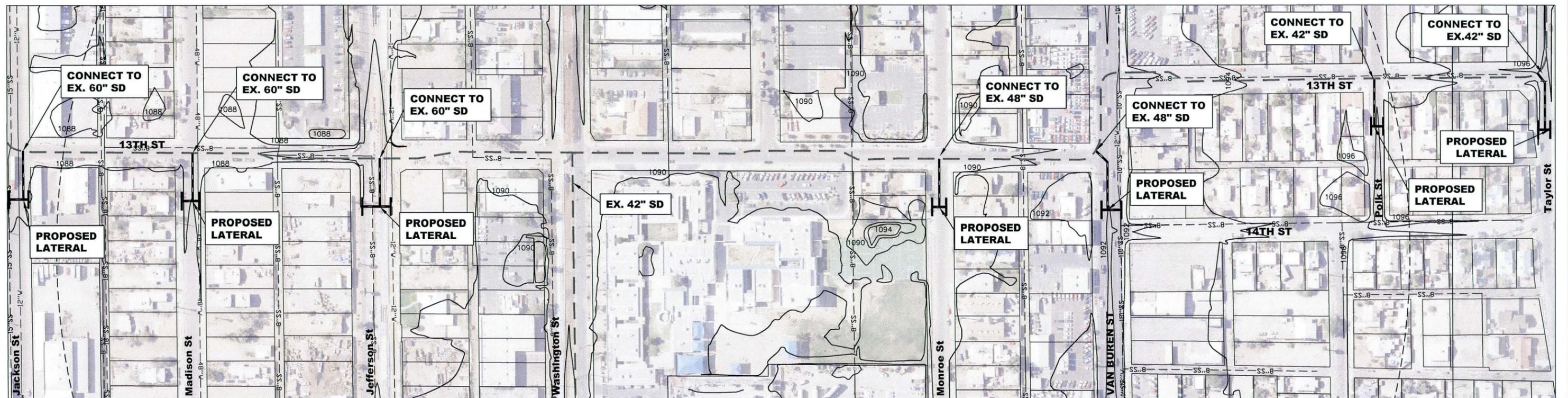
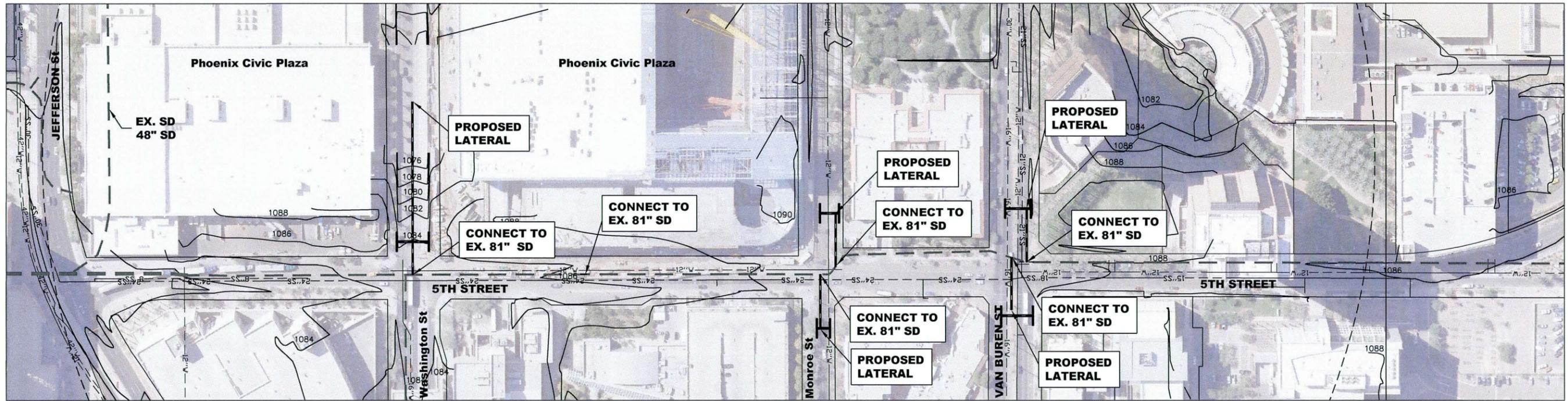
**9TH STREET STORM DRAIN
 TONTO ST TO TAYLOR ST**



PLAN SHEET
 STA. 200+00 to STA. 200+00

SHEET OF
 02 03

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

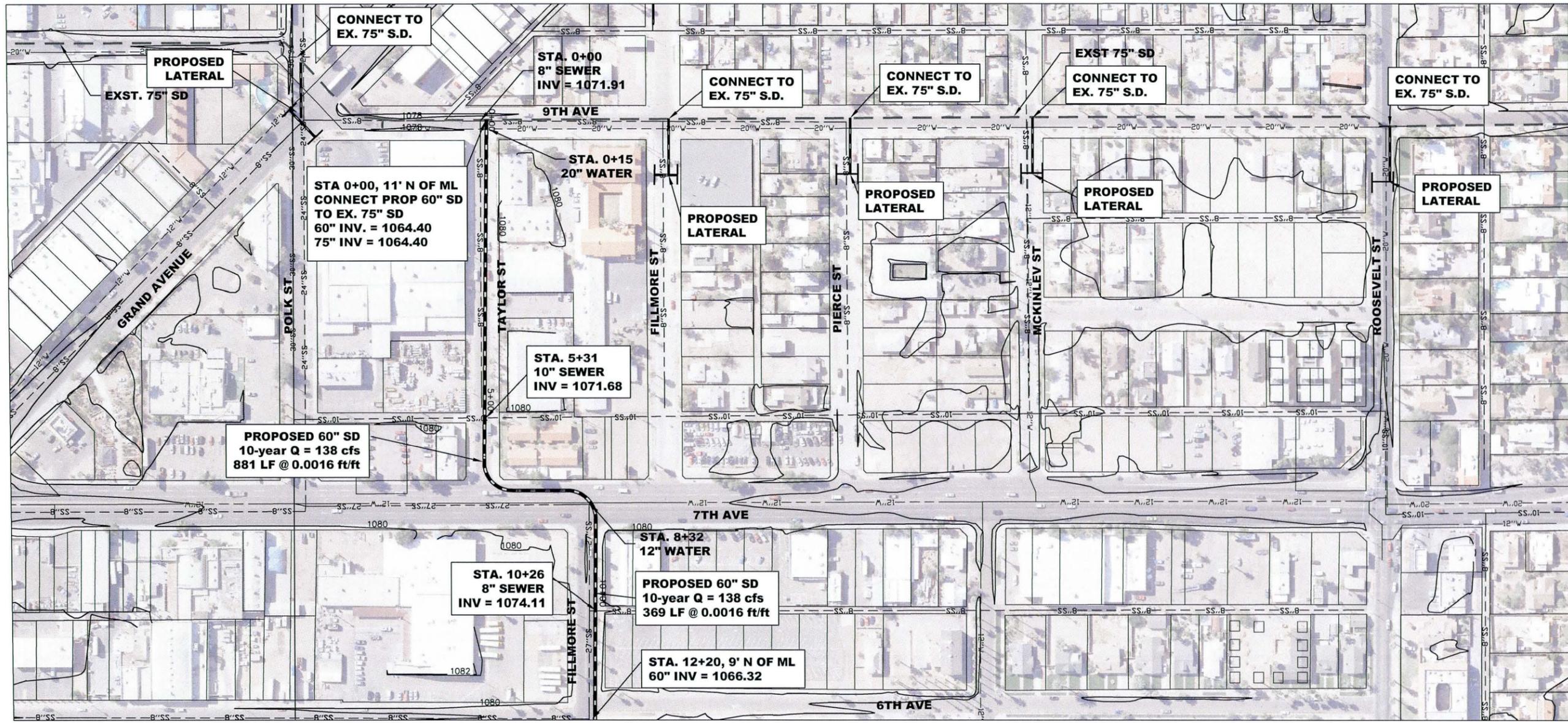


DOWNTOWN AREA
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

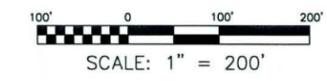
METRO PHOENIX ADMP		
PROJECT CONTROL NO. FCD2004C040		
	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08
9TH STREET STORM DRAIN		
5TH ST AND 13TH ST S.D. LATERALS		
eec	PLAN SHEET	SHEET OF 03 03

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX M
FILLMORE STREET (WEST) STORM DRAIN



MATCHLINE 12+20 SEE SHEET 2



DOWNTOWN AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

**FILLMORE STREET (WEST) SD
 9TH AVENUE TO 6TH AVENUE**

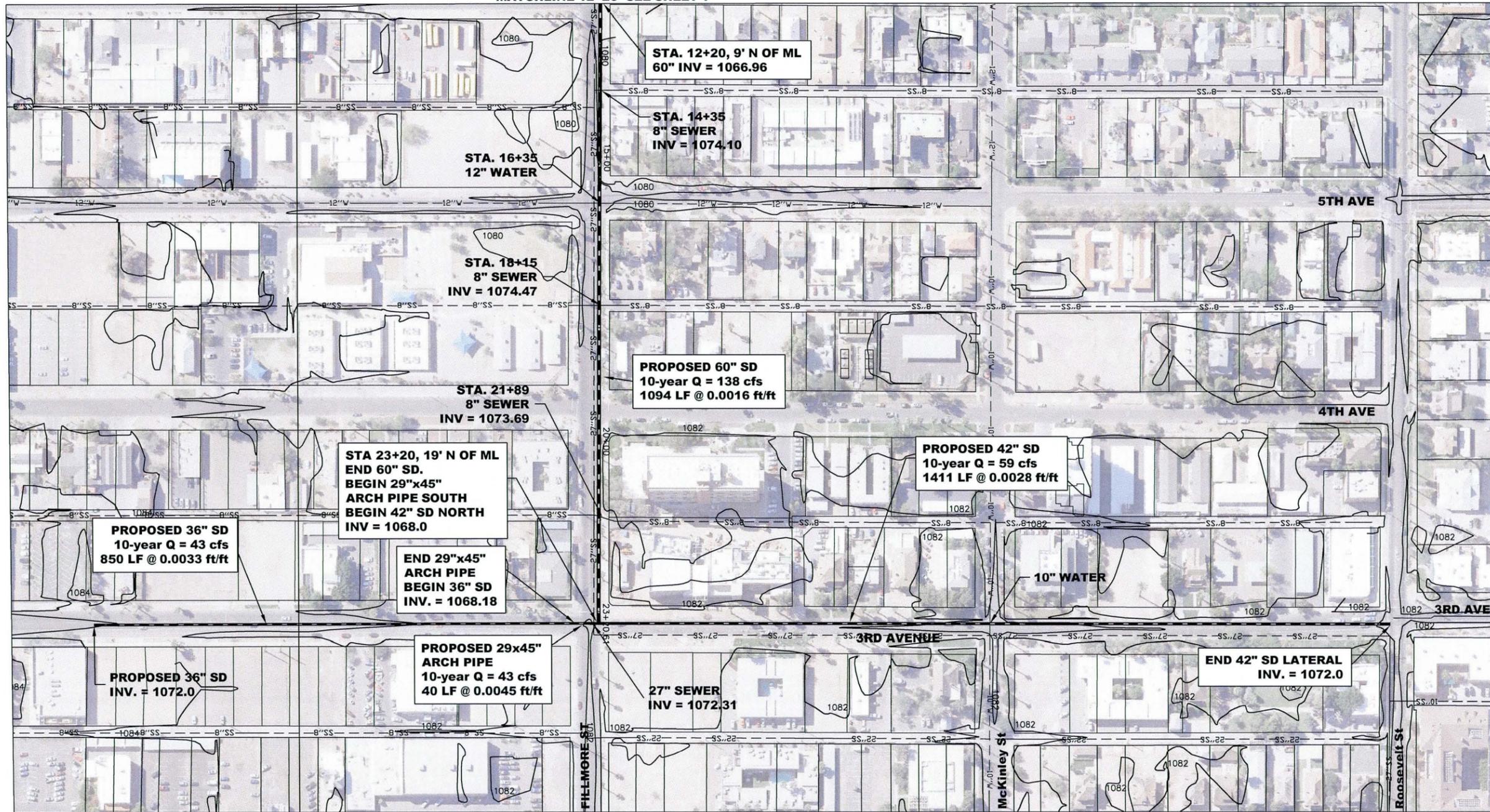


PLAN SHEET
 STA. 00+00 TO STA. 12+50

SHEET OF
 01 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 12+20 SEE SHEET 1



STA. 12+20, 9' N OF ML
60" INV = 1066.96

STA. 14+35
8" SEWER
INV = 1074.10

STA. 16+35
12" WATER

STA. 18+45
8" SEWER
INV = 1074.47

PROPOSED 60" SD
10-year Q = 138 cfs
1094 LF @ 0.0016 ft/ft

STA. 21+89
8" SEWER
INV = 1073.69

STA 23+20, 19' N OF ML
END 60" SD.
BEGIN 29"x45"
ARCH PIPE SOUTH
BEGIN 42" SD NORTH
INV = 1068.0

PROPOSED 42" SD
10-year Q = 59 cfs
1411 LF @ 0.0028 ft/ft

PROPOSED 36" SD
10-year Q = 43 cfs
850 LF @ 0.0033 ft/ft

END 29"x45"
ARCH PIPE
BEGIN 36" SD
INV. = 1068.18

10" WATER

PROPOSED 36" SD
INV. = 1072.0

PROPOSED 29x45"
ARCH PIPE
10-year Q = 43 cfs
40 LF @ 0.0045 ft/ft

END 42" SD LATERAL
INV. = 1072.0

27" SEWER
INV = 1072.31



DOWNTOWN AREA

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
CONCEPT	DESIGNED	CTG
PLANS	DRAWN	KLH, SB
NOT FOR CONSTRUCTION	CHECKED	LAV

eec	FILLMORE STREET (WEST) SD 6TH AVE TO 3RD AVE	
	PLAN SHEET	SHEET OF 02 02

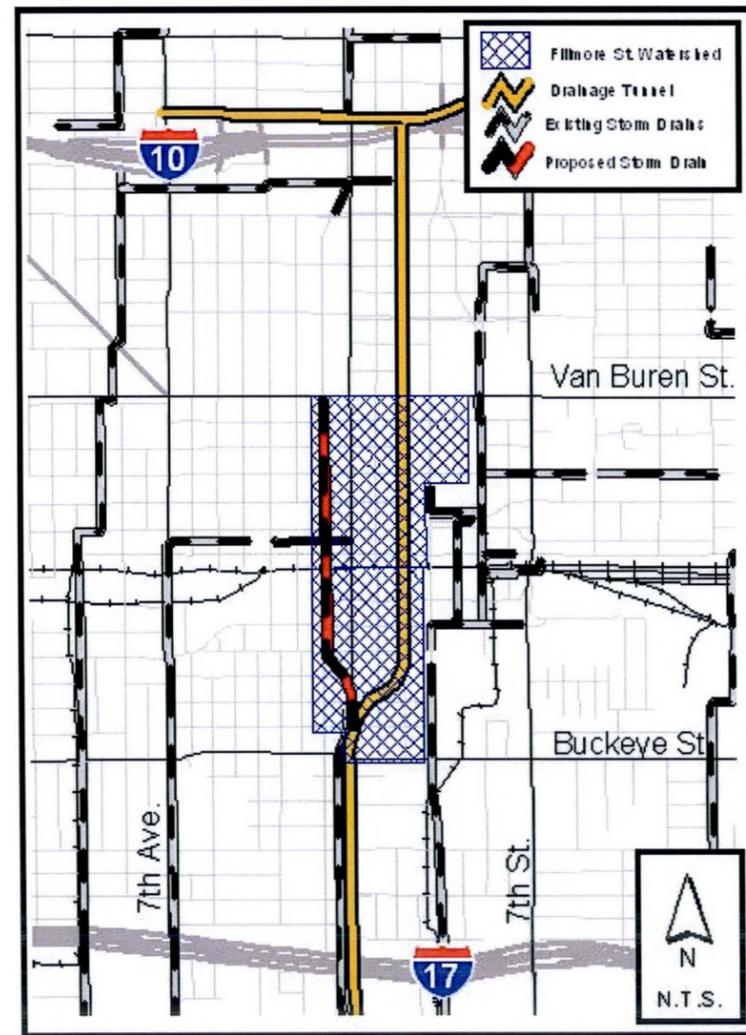
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX N
1ST AVENUE STORM DRAIN

1st Avenue Storm Drain, Van Buren Street to West Tunnel/Tonto Street – 10-year Storm Drain

The new 1st Avenue storm drain begins at Van Buren Street and runs south to where 1st Avenue merges with Central Avenue. The storm drain continues to the north of Buchanan Street in the 1st Avenue frontage road within the right-of-way. This is to avoid the very deep crossing of 1st Avenue under the railroad. At Madison Street, the alignment goes back to 1st Avenue. This storm drain discharges directly into ADOT’s west tunnel. The contributing watershed is between 1st Avenue and 2nd Street, from Buckeye Road to Van Buren Street.

North of Jackson Street, the new storm drain will intercept an existing storm drain that runs east to west in the alley north of Jackson Street. At Tonto Street it connects to ADOT’s west tunnel through an existing 72” stubout that is oriented to the east. This stubout will have to be reconstructed to be aligned to the west.

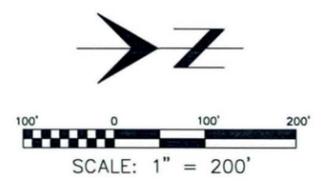
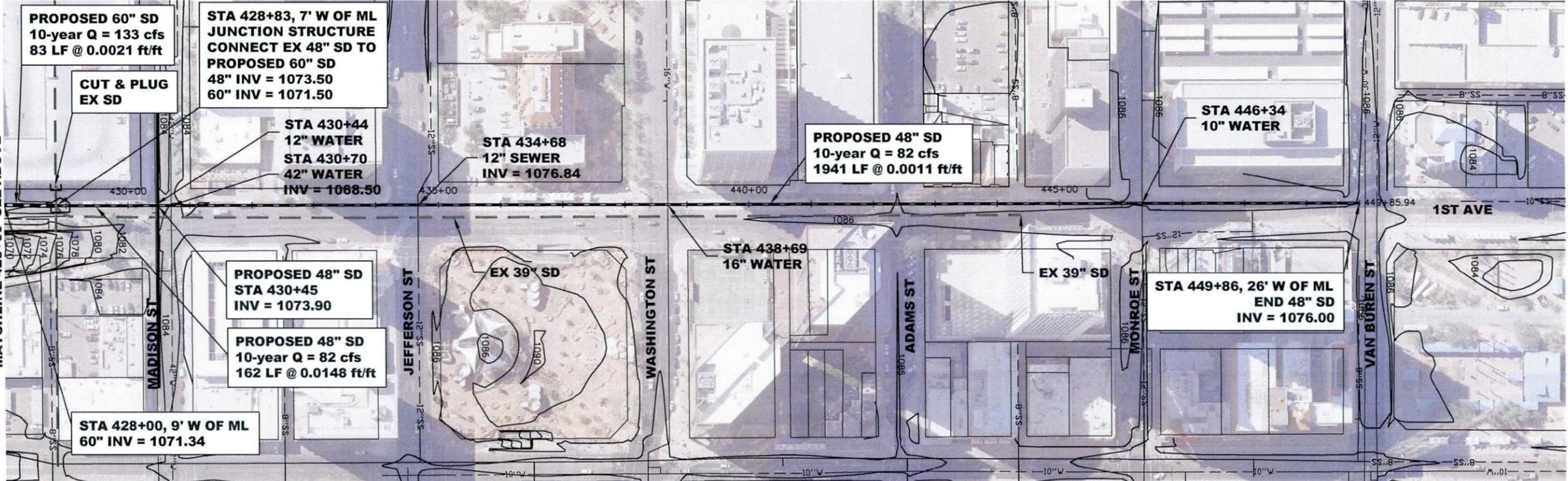
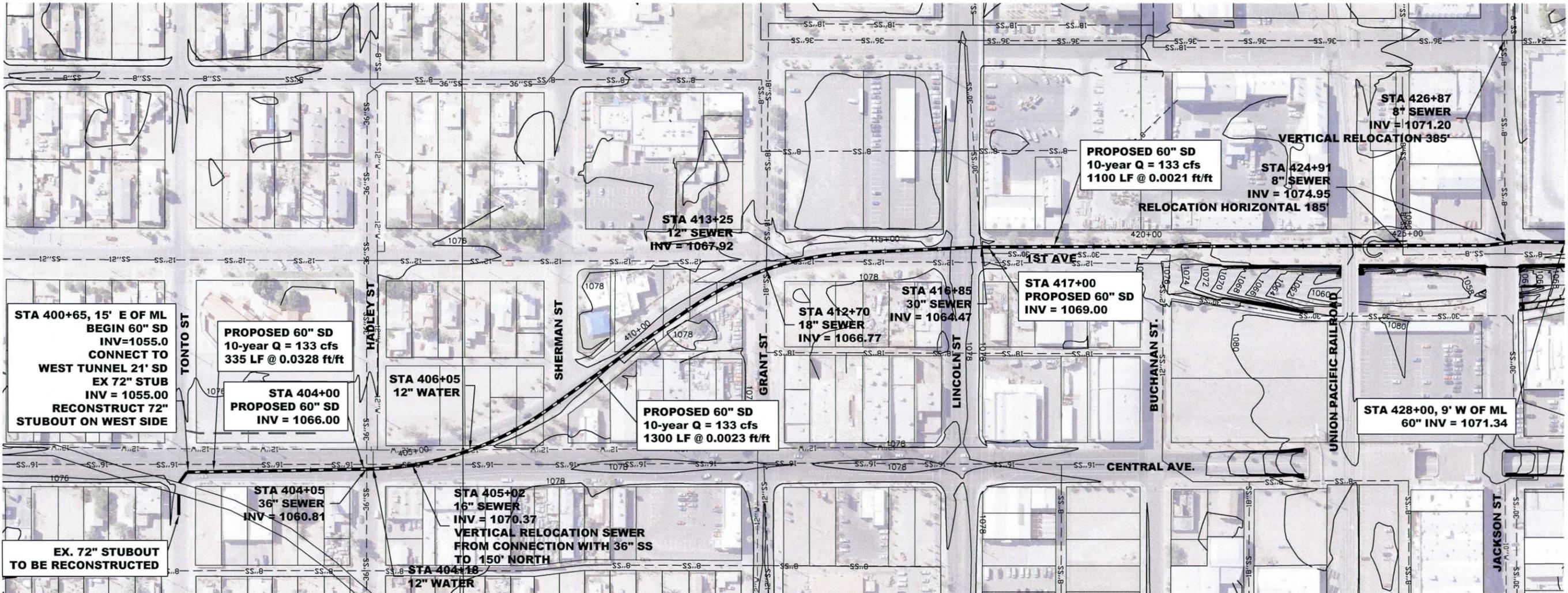


Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Discharge into ADOT’s West Tunnel at the existing stubout at Tonto Street. The stubout will need to be reconstructed to be aligned to the west, rather than its current orientation to the east. The storm drain discharge into the west tunnel is 133 cfs.
- The peak discharge rate from the IGA between the City and ADOT is 135 cfs and should not be exceeded.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAc sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

1st Avenue Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	48" SD in 1st Avenue, Van Buren to Lincoln STA. 428+83 to STA. 449+86	LF	\$617.20	2103	\$ 1,297,969
2	60" SD in 1st Avenue, Lincoln to Tonto/West Tunnel STA. 400+65 to STA. 428+83	LF	\$744.75	2818	\$ 2,098,699
3	Utility Relocation - 8" Sewerline	LF	\$100.00	385	\$ 38,500
4	Utility Relocation - 12" Sewerline	LF	\$100.00	185	\$ 18,500
5	Utility Relocation - 16" Waterline	LF	\$100.00	150	\$ 15,000
6	Reconstruct Stubout	EA	\$250,000.00	1	\$ 250,000
Sub Total					\$ 3,718,669
Contingencies (20%)					\$ 743,734
TOTAL					\$ 4,462,400

Note: The cost estimates are based on 100’ long laterals unless a specific condition was being met.



**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

DOWNTOWN AREA			
METRO PHOENIX ADMP			
PROJECT CONTROL NO. FCD2004C040			
		BY	DATE
DESIGNED	CTG		09/08
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
FIRST AVE STORM DRAIN TONTOST TO VAN BUREN ST			
PLAN SHEET		SHEET OF	
STA. 400+65 to STA. 449+86		01 01	

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 428+00 SEE BELOW

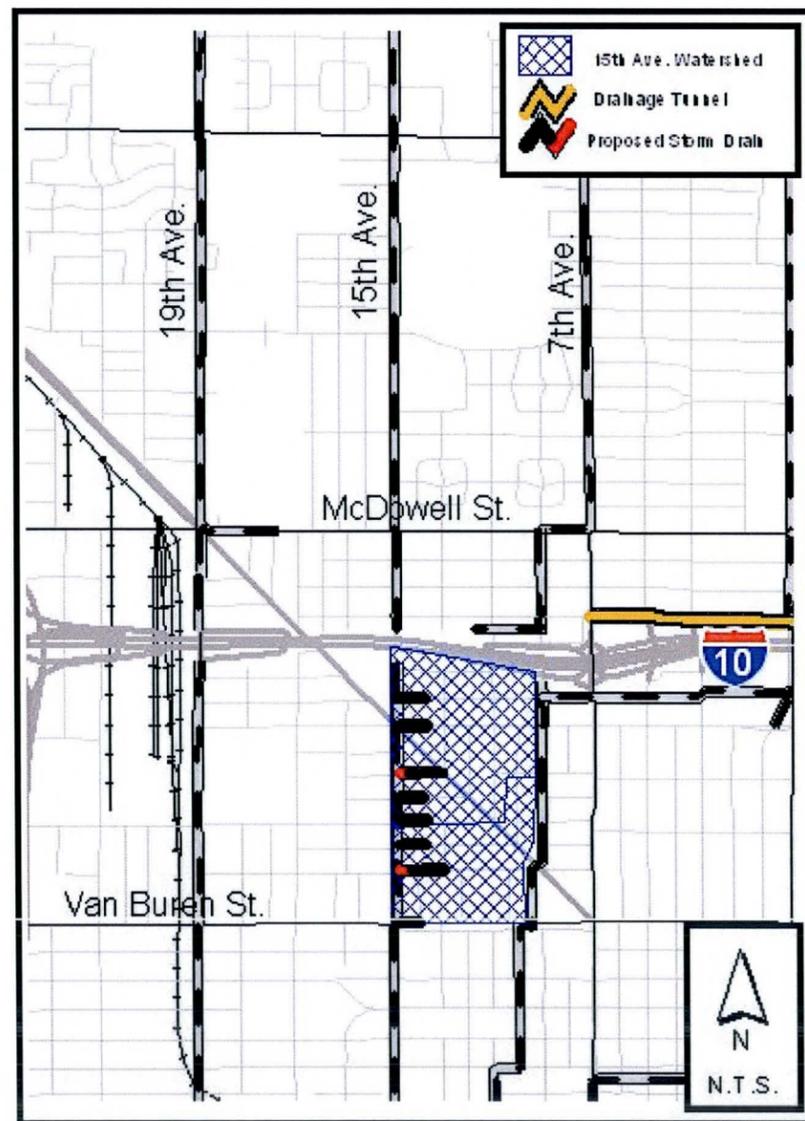
MATCHLINE 428+00 SEE ABOVE

APPENDIX O
MODIFICATIONS TO 15TH AVENUE STORM DRAIN

Add Inlets to the 15th Avenue Storm Drain, I-10 to Van Buren Street – 10-year Storm Drain

This project is the installation of new inlets and storm drain laterals on the existing 15th Avenue storm drain. The proposed McDowell Road storm drain (See Appendix I) will divert the existing 15th Avenue storm drain to ADOT’s I-10 interceptor. This leaves the storm drain with substantial capacity south of McDowell Road; providing substantial storm drain capacity for the downtown area. The ultimate outlet is the Salt River. The contributing watershed is from 15th Avenue to 9th Avenue, from Van Buren Street to I-10.

The existing 15th Avenue storm drain will have as many as eleven new laterals with the intent of providing 10-year interception capacity and conveyance into the existing 15th Avenue storm drain. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

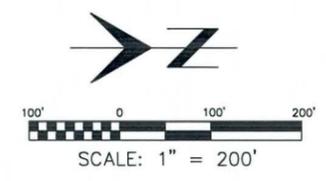
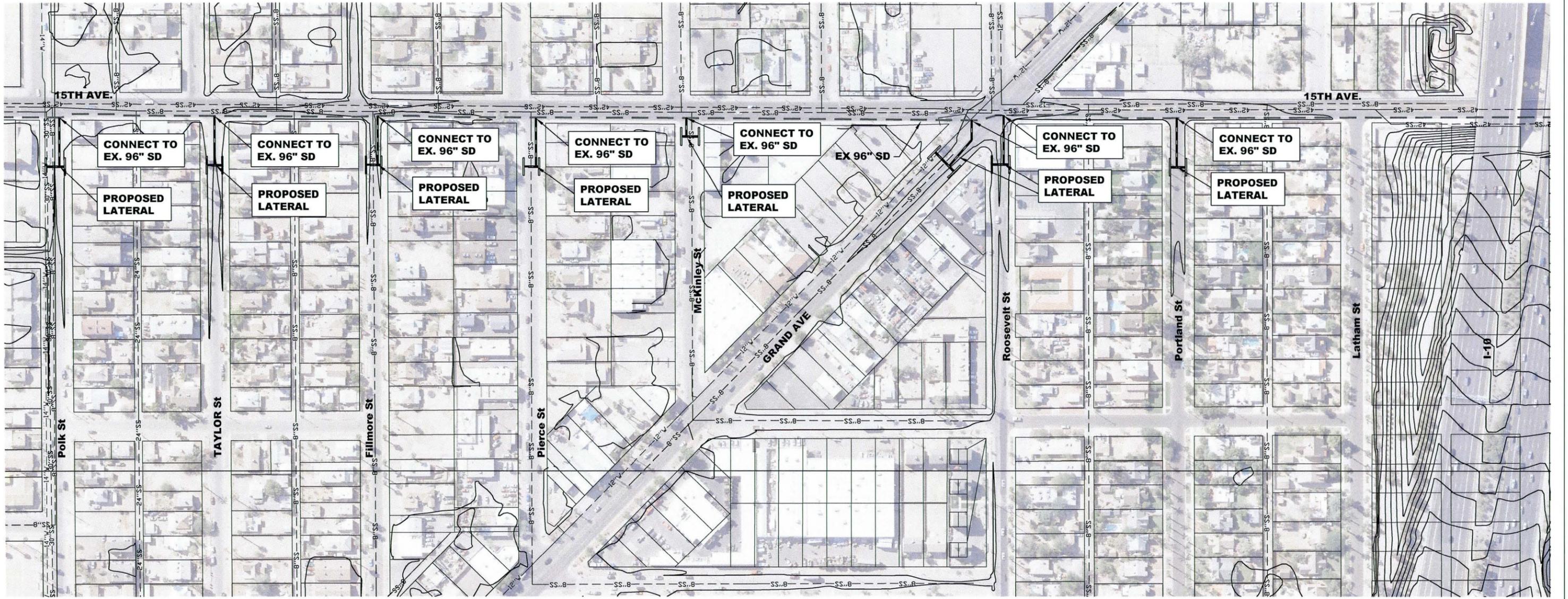


Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Take advantage of the unused capacity of the existing 15th Avenue storm drain by increasing storm water collection through adding new inlets and laterals.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

15th Avenue Storm Drain Laterals					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	New Inlets on Existing 15th Ave SD - Includes Connector Pipe	EA	\$10,000.00	14	\$ 140,000
2	New 30" Storm Drain Laterals on Existing 15th Ave. SD	LF	\$420.11	1000	\$ 420,106
3	Utility Relocation	LM	\$50,000.00	0.25	\$ 12,500
Sub Total					\$ 572,606
Contingencies (20%)					\$ 114,521
TOTAL					\$ 687,100

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



DOWNTOWN AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
CONCEPT PLANS	CTG	09/08
NOT FOR CONSTRUCTION	KLH, SB	09/08
	LAV	09/08

**15TH AVE LATERALS
 VAN BUREN TO I-10**



PLAN SHEET
 SHEET OF
 01 01

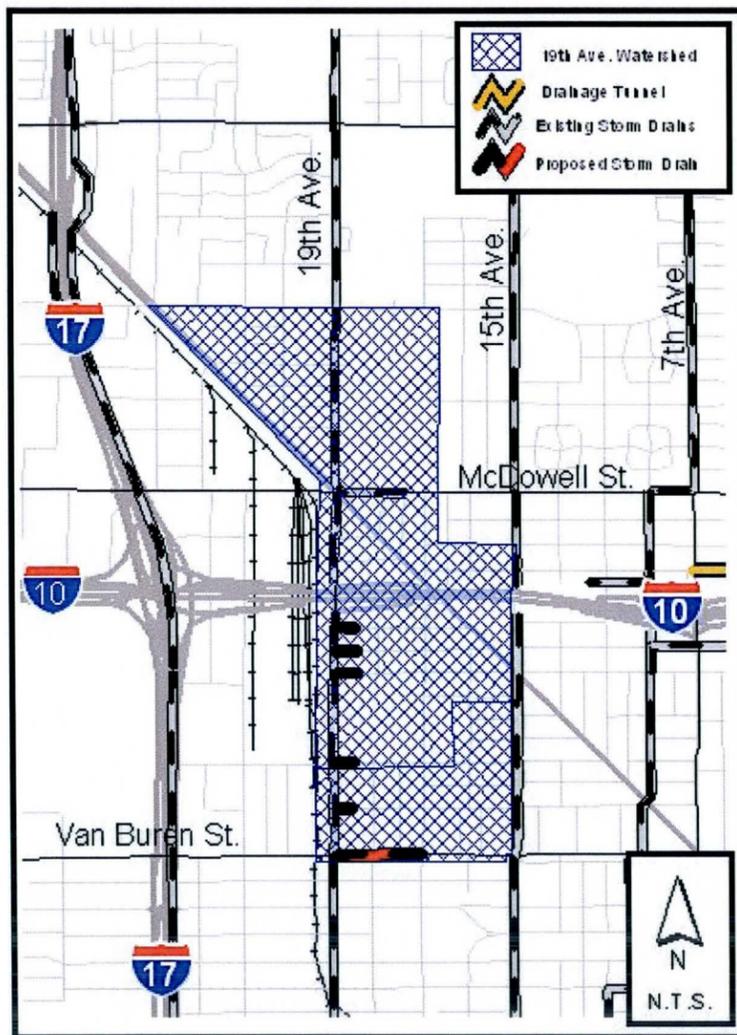
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX P
MODIFICATIONS TO 19TH AVENUE STORM DRAIN

Add Inlets to the 19th Avenue Storm Drain, I-10 to Van Buren Street – 10-year Storm Drain

The existing 19th Avenue storm drain will have substantial excess capacity due to the planned diversion of flows into the proposed Encanto Golf Course Detention Basin (See Appendix H). The low flow bypass and the outflow from the proposed detention basin only account for a small percentage of the existing 19th Avenue pipe capacity; freeing up considerable extra capacity for the area south of the Encanto Golf Course. Therefore, this project is the installation of new inlets and storm drain laterals on the 19th Avenue storm drain. The contributing watershed is between 19th Avenue and 15th Avenue, from Van Buren Street to Encanto Boulevard.

The existing 19th Avenue storm drain will have as many as twelve new laterals. All laterals will have large storm drain inlets with the intent of providing 10-year interception capacity for the existing 19th Avenue storm drain. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

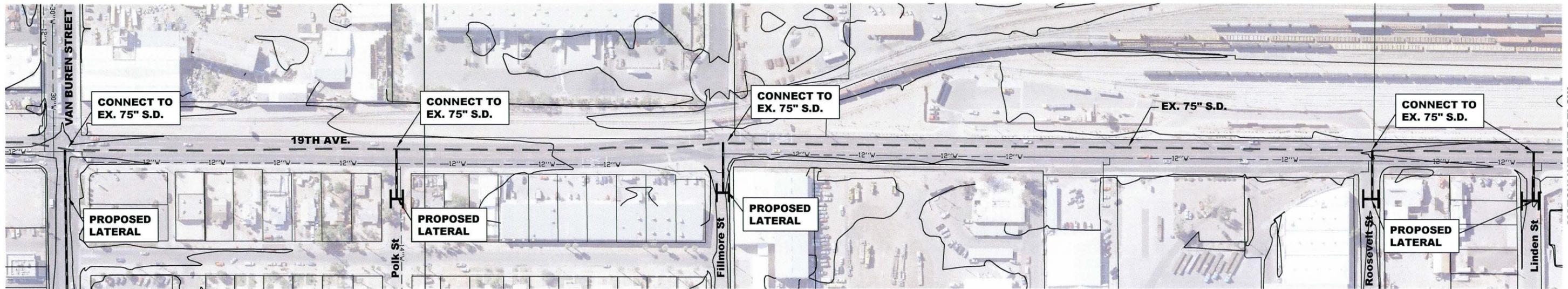


Design Elements/Constraints

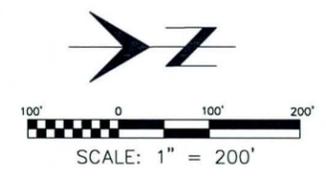
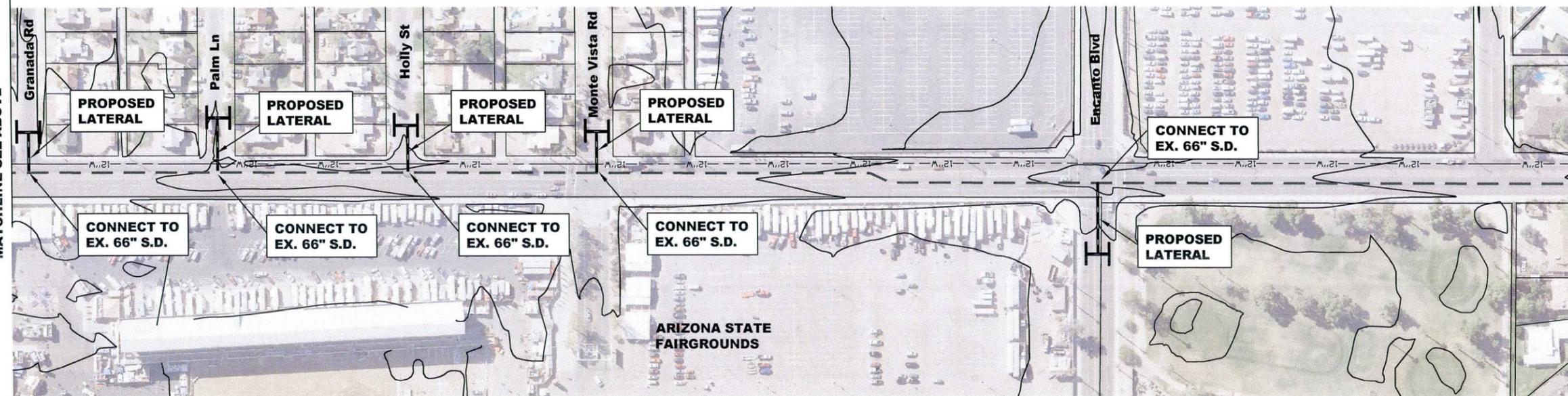
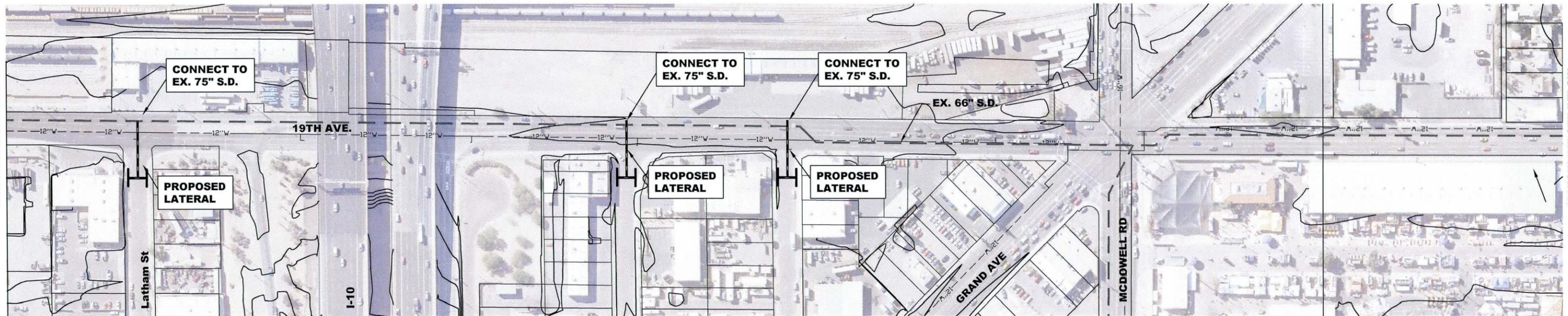
- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Take advantage of the unused capacity of the existing 19th Avenue storm drain by increasing storm water collection through adding new inlets and laterals.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

19th Avenue Storm Drain Laterals					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	New Inlets on Existing 19th Ave. SD - Includes Connector Pipe	EA	\$10,000.00	15	\$ 150,000
2	New 30" Storm Drain Laterals on Existing 19th Ave. SD	LF	\$420.11	800	\$ 336,085
3	Van Buren Street Lateral	LF	\$420.11	1300	\$ 546,138
4	Van Buren Street Lateral - Inlets	EA	\$10,000.00	6	\$ 60,000
Sub Total					\$ 1,092,222
Contingencies (20%)					\$ 218,444
TOTAL					\$ 1,310,700

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



Lateral extends to 17th Avenue



DOWNTOWN AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
CONCEPT	DESIGNED CTG	09/08
PLANS	DRAWN KLH, SB	09/08
NOT FOR CONSTRUCTION	CHECKED LAV	09/08

**19TH AVE S.D. LATERALS
 VAN BUREN ST TO MCDOWELL**



PLAN SHEET SHEET OF 01 01

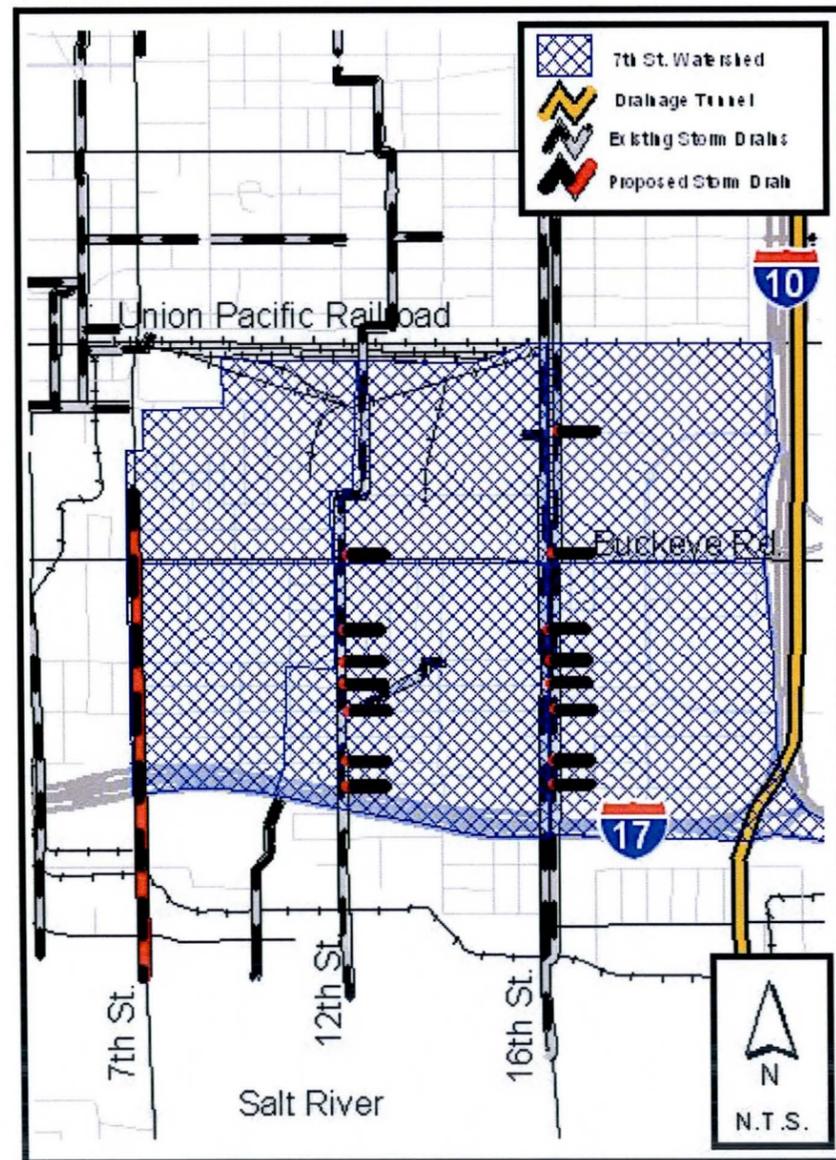
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX Q
7TH STREET STORM DRAIN

7th Street Storm Drain, Sherman Street to Salt River – 10-year Storm Drain

The new 7th Street storm drain begins just north of Tonto Street and runs south to the Salt River. The contributing watershed is between 7th Street and I-10, from I-17 to the Union Pacific Railroad.

The project will also include upgrading the 12th Street and 16th Street existing storm drains by adding inlets and laterals. All laterals will have large storm drain inlets with the intent of providing 10-year interception capacity for the existing 12th and 16th Street storm drains which have substantial excess capacity. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

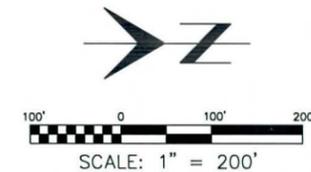
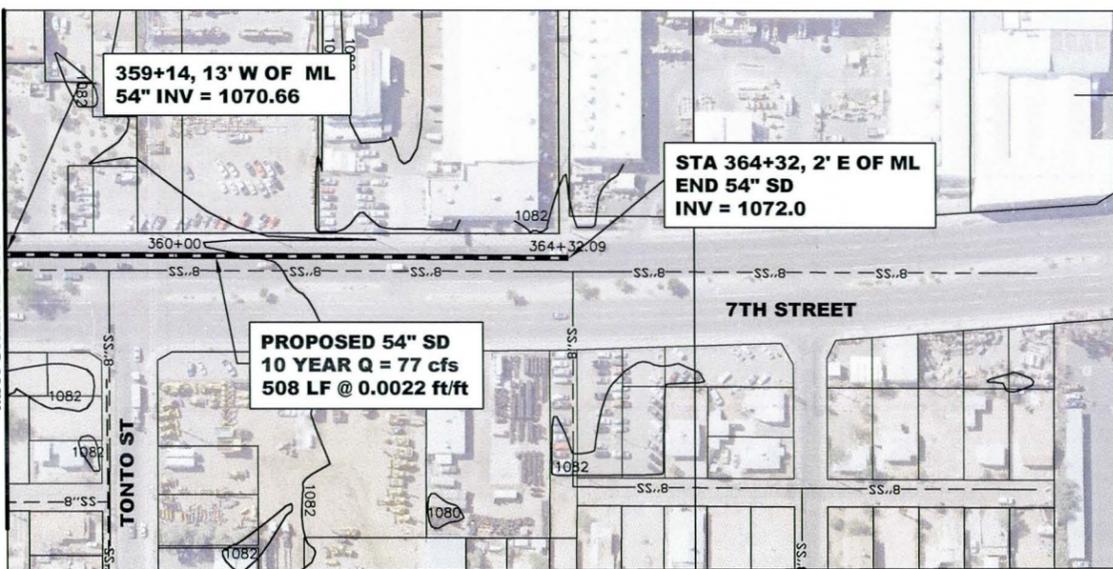
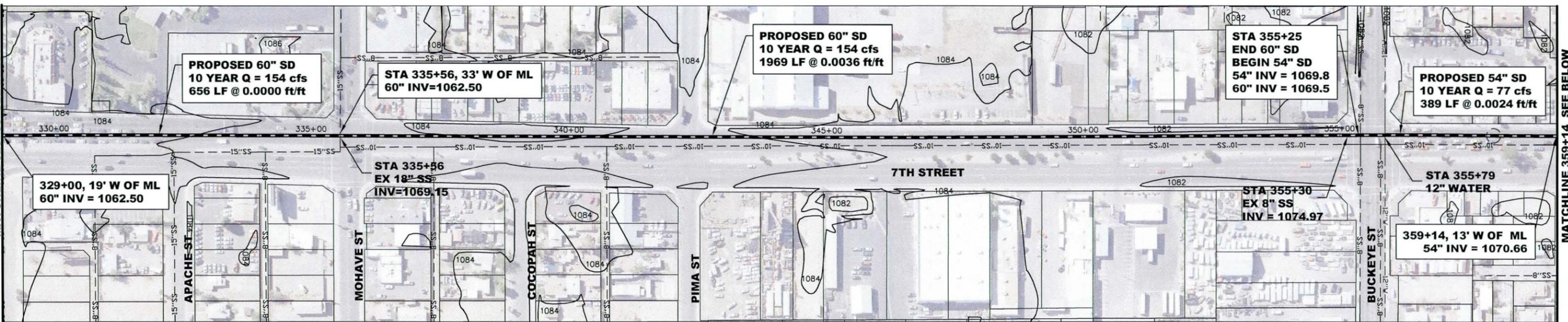
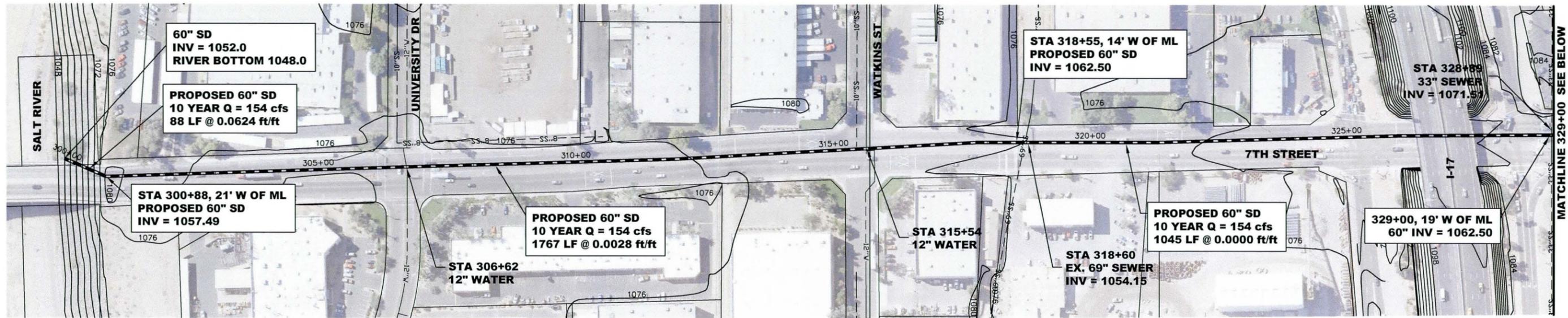


Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed. The 12th and 16th Street storm drains will need to be included as part of this study.
- Since this storm drain will be discharging within the Rio Salado river restoration project area, it will be important to minimize the impact that the outlet has on the River’s habitat. Requirements for the design of the storm drain outlet will include: 1) restoring the habitat that is disturbed at the pipe outlet structure to its existing condition (which will probably be significantly dense by the time this storm drain is constructed), 2) providing trash racks at the outlets to prevent garbage from entering the habitat restoration area, and 3) providing dry weather crossings for the maintenance road which lies above the river bottom, running along the toe of slope of the river bank.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAR sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

7th Street Storm Drain		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	54" SD in 7th Street, Sherman Street to Buckeye STA 355+45 to STA. 364+32	LF	\$680.99	887	\$ 604,042
2	60" SD in 7th Street, Buckeye to Salt River STA 300+00 to STA. 355+45	LF	\$744.75	5545	\$ 4,129,627
3	New Inlets on Existing 16th Street Storm Drain	EA	\$10,000.00	8	\$ 80,000
4	New 30" Storm Drain Laterals on Existing 16th St. SD	LF	\$420.11	400	\$ 168,042
5	New Inlets on Existing 12th Street Storm Drain	EA	\$10,000.00	14	\$ 140,000
6	New 30" Storm Drain Laterals on Existing 12th St. SD	LF	\$420.11	700	\$ 294,074
Sub Total					\$ 5,415,785
Contingencies (20%)					\$ 1,083,157
TOTAL					\$ 6,498,900

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



DOWNTOWN AREA

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

SEVENTH STREET STORM DRAIN
SALT RIVER TO TONTO ST

eec	PLAN SHEET	SHEET OF
	STA. 300+00 to STA. 364+22	01 01

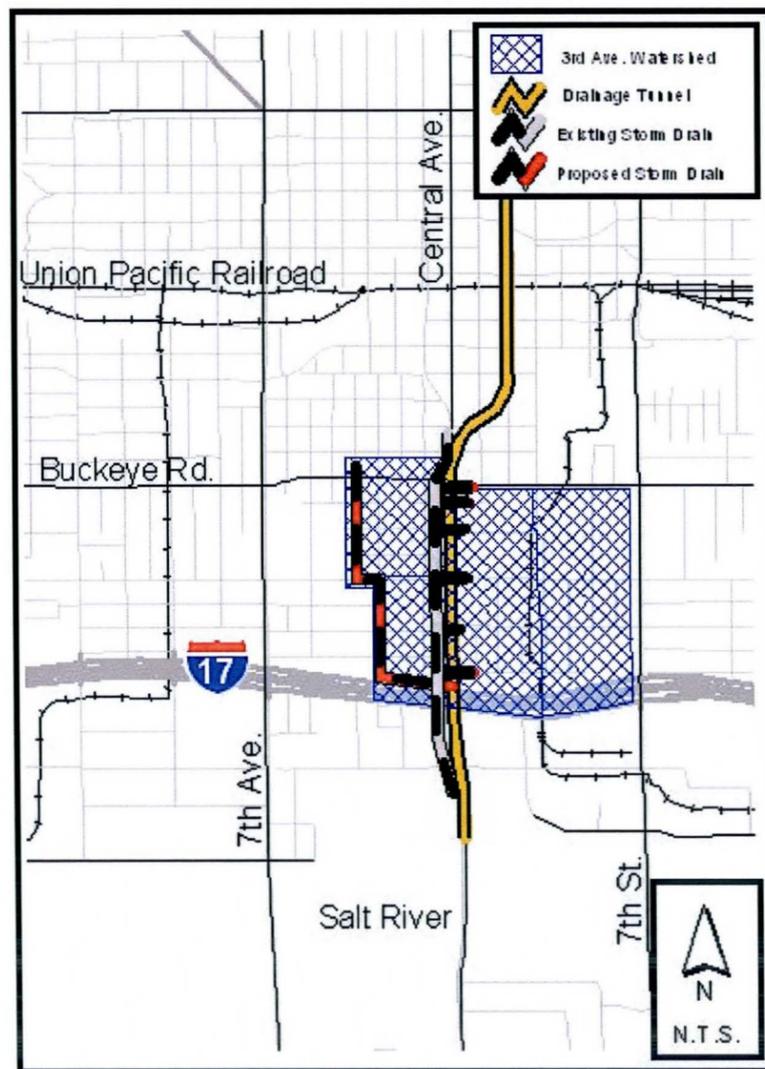
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX R
3RD AVENUE STORM DRAIN

3rd Avenue Storm Drain, Buckeye Road to West Tunnel/I-17 – 10-year Storm Drain

The new 3rd Avenue storm drain connects to ADOT’s existing West Tunnel. The new storm drain intercepts and diverts flow to the south and then east where it connects to an existing stub in ADOT’s system. The contributing watershed for this storm drain is between Harmon Parkway and Central Avenue, from I-17 to Buckeye Road. This project also includes the installation of new inlets and storm drain laterals on the Central Avenue storm drain. The combined capacity of the existing Central Avenue storm drain and the new 3rd Avenue storm drain provides 10-year conveyance for the designated watershed.

The new storm drain begins in Harmon Parkway at Buckeye Road continues south to Pima and then east to 3rd Avenue, south in 3rd Avenue to Apache Street, east in Apache Street to 1st Avenue, south in 1st Avenue to the I-17 frontage road and then east to Central Avenue where it discharges into ADOT’s West Tunnel via an existing 48-inch diameter stubout.

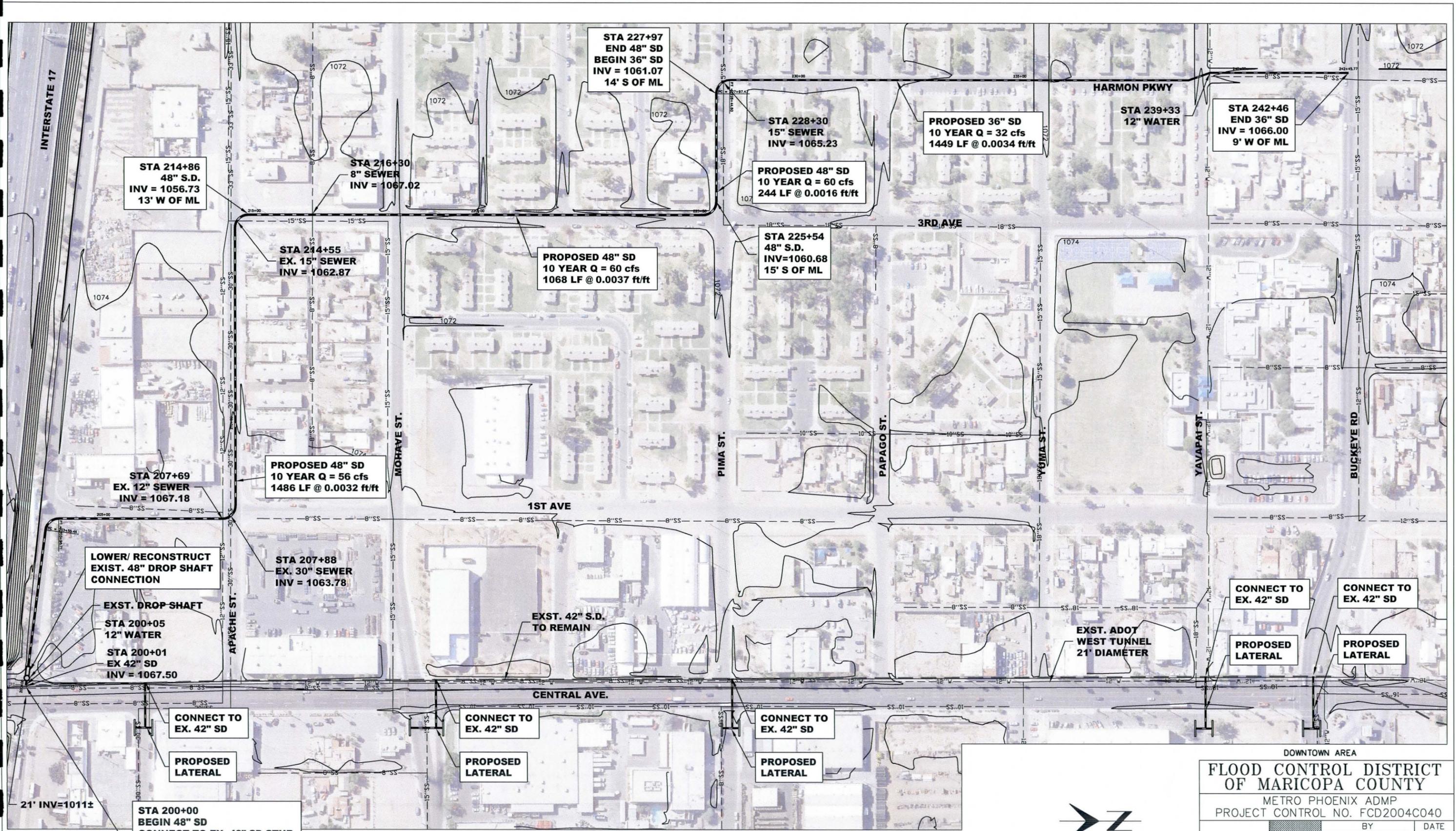


Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed. This includes the new 3rd Avenue storm drain as well as the existing Central Avenue storm drain
- Outfall into ADOT’s West Tunnel via an existing stubout at the I-17 frontage road. The storm drain discharge into the west tunnel is 56 cfs.
- The peak discharge rate from the IGA between the City and ADOT is 60 cfs and should not be exceeded.
- ADOT’s existing stubout connection to the Gila Coil Dropshaft will have to be reconstructed to lower the connection invert about 13 feet. The existing invert is 1065 and will need to be lowered to 1052. The Gila Coil Dropshaft will not need to be reconfigured. The West Tunnel invert is 1011 allowing this stubout invert to be lowered.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

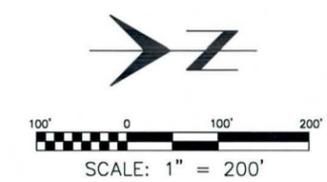
3rd Avenue Storm Drain					Unit	Price	Quantity	Amount
Item No.	Item Description	Unit	Price	Quantity	Amount			
1	36" SD in Harmon Parkway, Pima to Buckeye STA. 227+97 to STA. 242+46	LF	\$479.85	1449	\$ 695,303			
2	48" SD in 3rd Avenue, West Tunnel at I-17 to Pima St STA. 200+00 to STA. 227+97	LF	\$617.20	2797	\$ 1,726,305			
3	New Inlets on Existing Central Ave. SD	EA	\$10,000.00	12	\$ 120,000			
4	New 30" Storm Drain Laterals on Existing Central Ave. SD	LF	\$420.11	600	\$ 252,064			
5	Reconstruct Dropshaft	EA	\$100,000.00	1	\$ 100,000			
Sub Total					\$	2,893,672		
Contingencies (20%)					\$	578,734		
TOTAL					\$	3,472,400		

Note: The cost estimates are based on 100’ long laterals unless a specific condition was being met.



21' INV=1011±

STA 200+00
 BEGIN 48" SD
 CONNECT TO EX. 48" SD STUB
 EX. INV = 1065.0
 PROP. INV = 1052.00
 3' N OF ML



DOWNTOWN AREA

**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

CONCEPT PLANS NOT FOR CONSTRUCTION

**THIRD AVE STORM DRAIN
 I-17 TO BUCKEYE RD**

eec	PLAN SHEET	SHEET OF
	STA. 200+00 to STA. 245+77	01 01

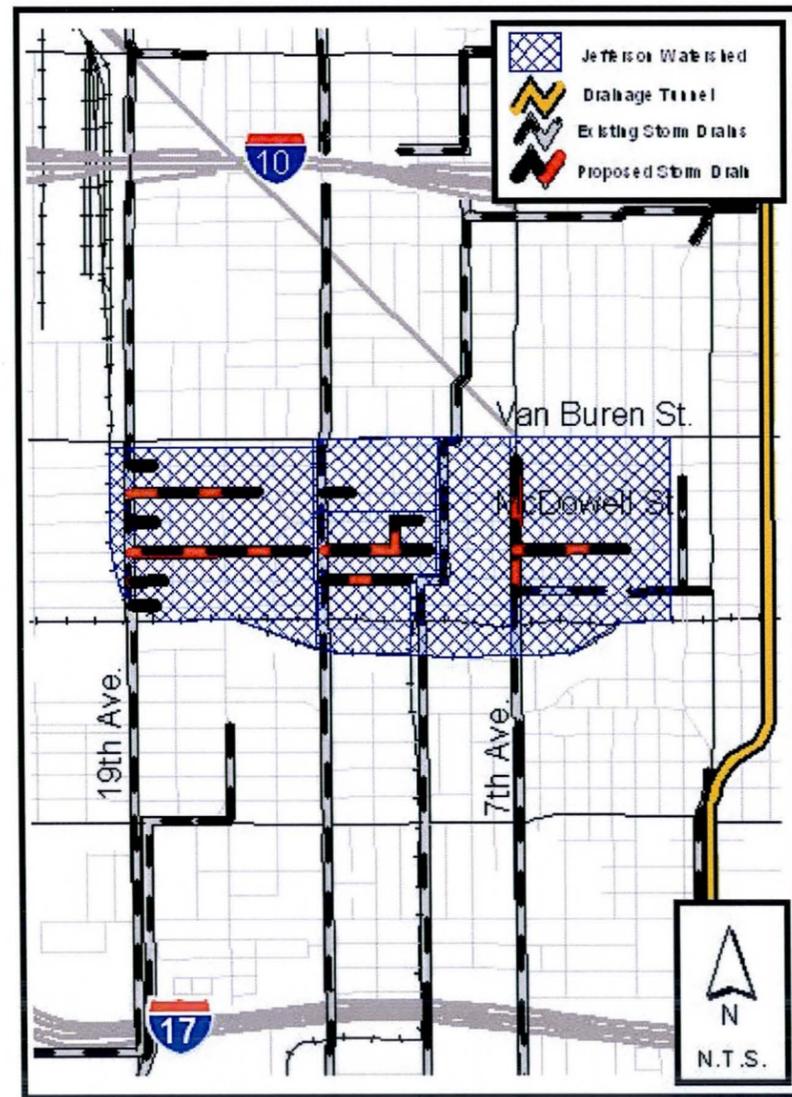
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX S
JEFFERSON STREET STORM DRAIN SYSTEM

Jefferson Street Storm Drain System, 19th Avenue to 1st Avenue – 10-year Storm Drain

The proposed storm drain system in this area will consist of three items: 1) upgrade the existing 19th Avenue Storm drain, 2) upgrade the existing 15th Avenue storm drain, and 3) extend the existing 7th Avenue storm drain north and add laterals. The contributing watershed is between 19th Avenue and 1st Avenue from Van Buren Street to the Union Pacific Railroad.

The existing 19th Avenue storm drain has significant excess capacity due to the planned diversion of stormwater into the proposed Encanto Golf Course Detention Basin. This project is the installation of new inlets and storm drain laterals on the 19th Avenue storm drain. The contributing watershed is between 19th Avenue and 15th Avenue, from Van Buren Street to the Union Pacific Railroad. All laterals will have large storm drain inlets with the intent of providing 10-year interception capacity for the existing 19th Avenue storm drain. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.



The Jefferson Street storm drain system includes the installation of new inlets and storm drain laterals on the existing 9th Avenue and 15th Avenue storm drains. The contributing watershed is from 15th Avenue to 8th Avenue, from Van Buren Street to the Union Pacific Railroad. All of the laterals will have large storm drain inlets with the intent of providing 10-year interception capacity and conveyance into the existing 15th Avenue and 9th Avenue storm drains. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

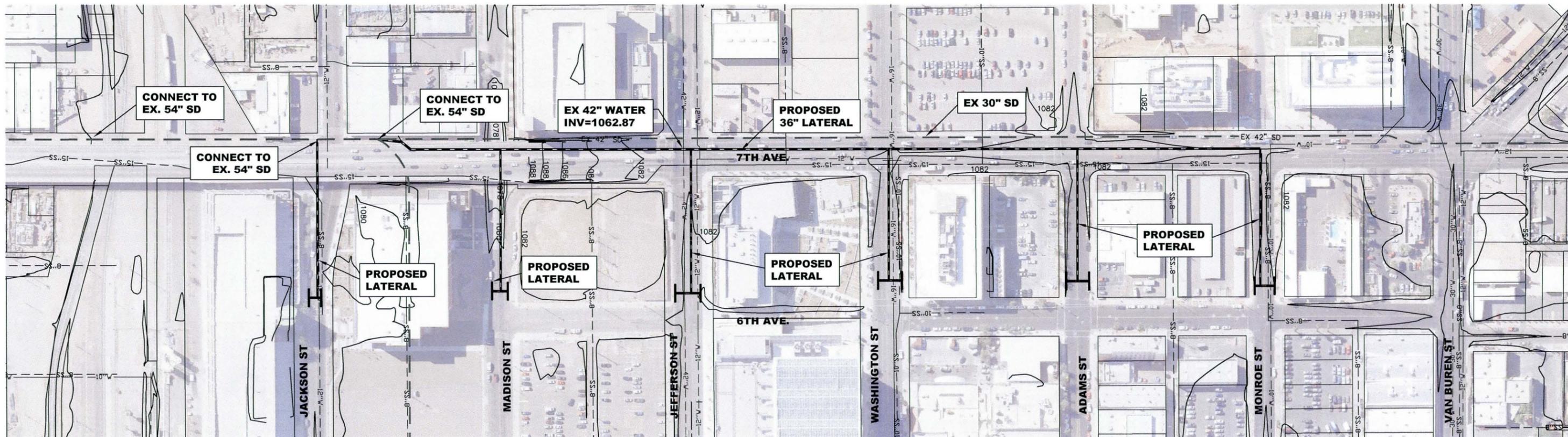
It also includes the installation of an extension of the 7th Avenue storm drain to Van Buren Street and adding laterals to the east to provide 10-year protection. The drainage area extends from 7th Avenue to 1st Avenue from Van Buren Street to the Union Pacific Railroad. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

Design Elements/Constraints

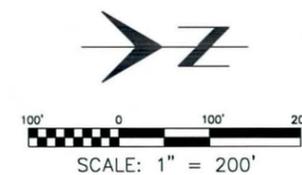
- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed. The 15th and 19th Avenue storm drains will need to be included as part of this study.
- The proposed Encanto Golf Course Detention Basin needs to be in place in order for the 19th Avenue storm drain to provide an overall 10-year protection.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAR sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Jefferson Street Storm Drains		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	New Inlets on Existing 19th Ave. SD - Includes Connector Pipe	EA	\$10,000.00	8	\$ 80,000
2	New 30" Storm Drain Laterals on Existing 19th Ave. SD	LF	\$420.11	400	\$ 168,042
3	Jefferson Street Lateral (19th Ave to 16th Ave)	LF	\$420.11	2400	\$ 1,008,254
4	Jefferson Street Lateral - Inlets (19th Ave to 16th Ave)	EA	\$10,000.00	8	\$ 80,000
5	Adams Street Lateral (19th Ave to 16th Ave)	LF	\$420.11	1800	\$ 756,191
6	Adams Street Lateral - Inlets (19th Ave to 16th Ave)	EA	\$10,000.00	6	\$ 60,000
7	Van Buren Street Lateral (19th Ave to 16th Ave)	LF	\$420.11	1300	\$ 546,138
8	Van Buren Street Lateral - Inlets	EA	\$10,000.00	6	\$ 60,000
9	Jefferson Street Lateral (15th Ave to 11th Ave)	LF	\$420.11	1320	\$ 554,540
10	Jefferson Street Lateral - Inlets (15th Ave to 8th Ave)	EA	\$10,000.00	6	\$ 60,000
11	Madison Street Lateral (15th Ave to 8th Ave)	LF	\$420.11	1320	\$ 554,540
12	Madison Street Lateral - Inlets (15th Ave to 1th Ave)	EA	\$10,000.00	4	\$ 40,000
13	Jefferson Street Lateral (7th Ave to 3rd ave)	LF	\$420.11	1500	\$ 630,159
14	36" SD in 7th Avenue, Monroe to Jackson	LF	\$479.85	1800	\$ 863,730
Sub Total					\$ 5,461,593
Contingencies (20%)					\$ 1,092,319
TOTAL					\$ 6,553,900

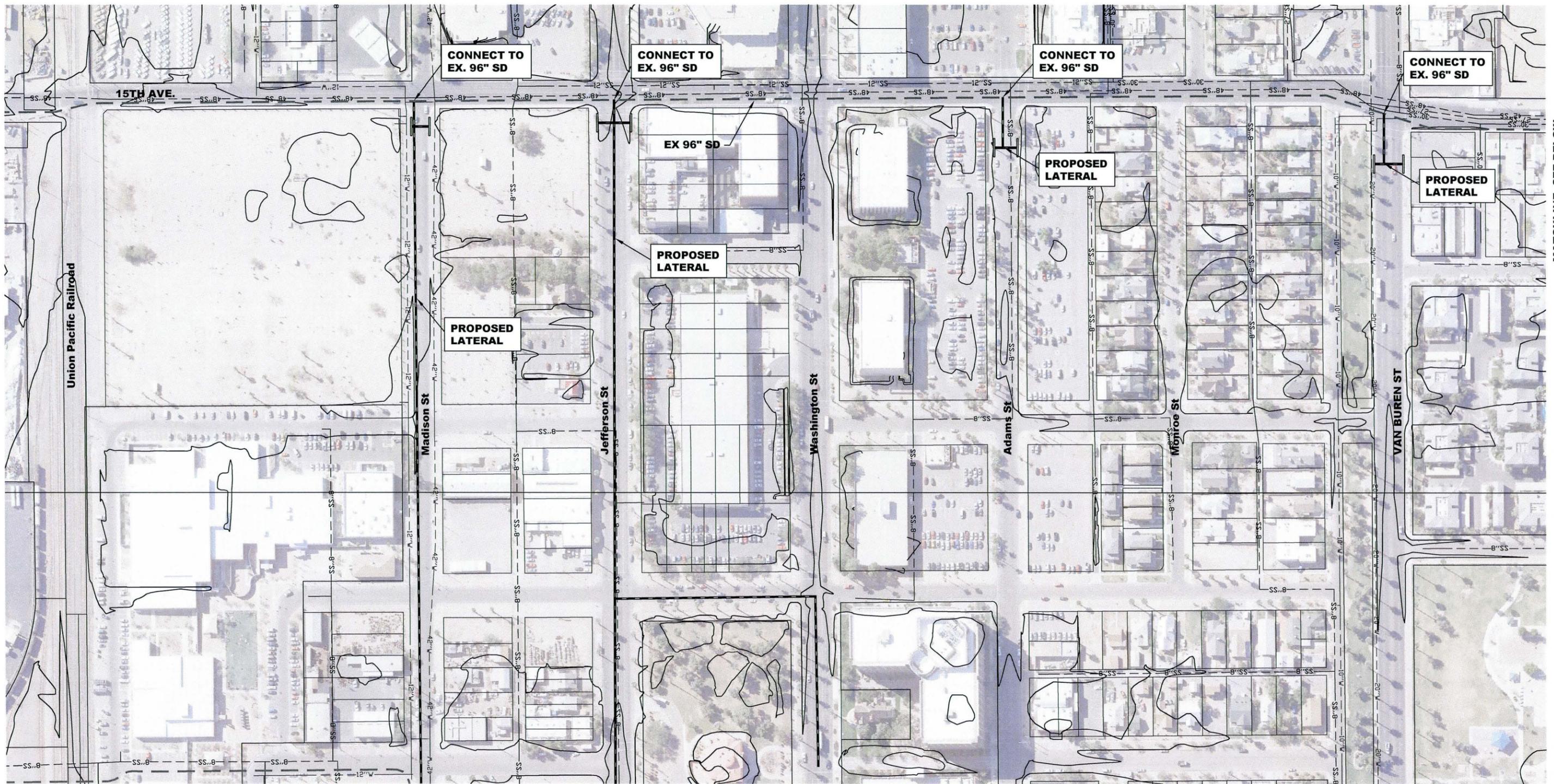
Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



NOTE: THERE IS AN EXISTING 30" SD IN 7TH AVENUE NORTH OF JACKSON STREET. A PARALLEL PIPE COULD BE PUT IN PLACE AS SHOWN OR THE 30" COULD BE REPLACED WITH A LARGER DIAMETER SD



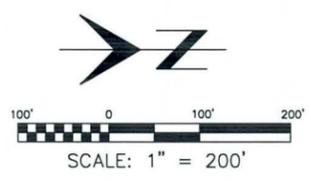
DOWNTOWN AREA			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040			
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08
JEFFERSON STREET STORM DRAIN 7TH AVE, JACKSON TO VAN BUREN			
eec	PLAN SHEET LATERALS	SHEET OF 01 03	



MATCHLINE SEE BELOW

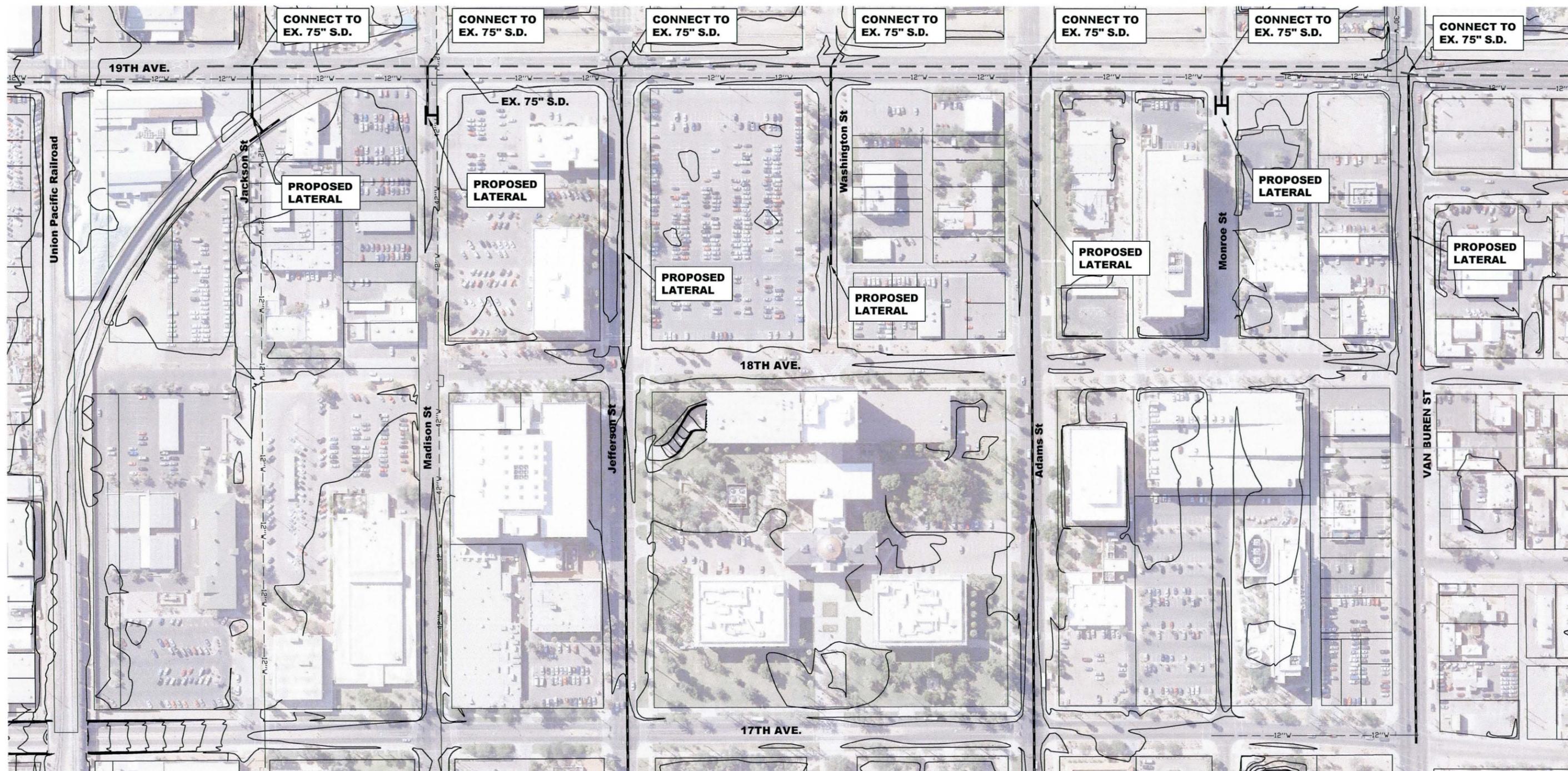
**MADISON STREET
LATERAL CONTINUES TO 11TH AVE.**

**JEFFERSON STREET
LATERAL CONTINUES TO 11TH AVE.**



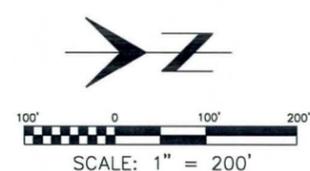
DOWNTOWN AREA			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040			
		BY	DATE
DESIGNED	CTG		09/08
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
JEFFERSON STREET SD 15TH AVE, UPRR TO VAN BUREN ST			
PLAN SHEET			SHEET OF 02 03

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



JEFFERSON ST LATERAL CONTINUES TO 15TH AVE

ADAMS ST LATERAL CONTINUES TO 16TH AVE



DOWNTOWN AREA			
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY			
METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040			
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	09/08
	DRAWN	KLH, SB	09/08
	CHECKED	LAV	09/08
JEFFERSON STREET SD 19TH AVE, UPRR TO VAN BUREN ST			
 PLAN SHEET			SHEET OF 03 03

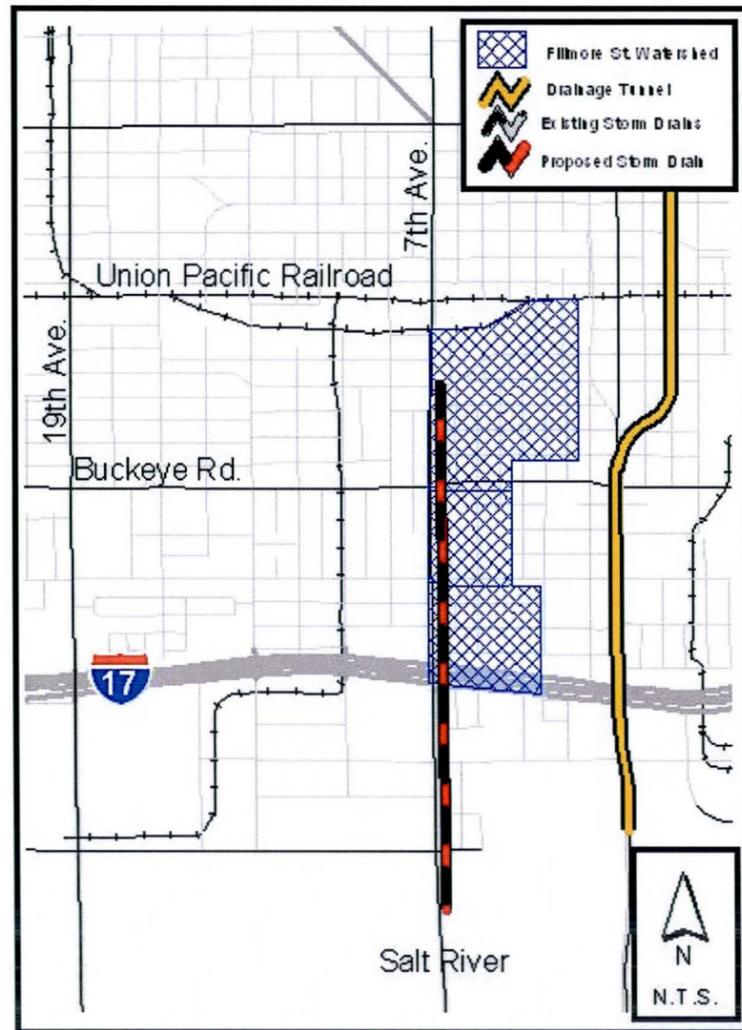
AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX T
7TH AVENUE STORM DRAIN

7th Avenue Storm Drain, Grant Street to Salt River – 10-year Storm Drain

The new 7th Avenue storm drain intercepts and diverts flow to the south in 7th Avenue between Grant Street and the Salt River. The new storm drain parallels an existing storm drain and the combination of the two pipes has conveyance capacity for the 10-year runoff for the contributing watershed identified as between 7th Avenue and 3rd Avenue, from I-17 to the Union Pacific Railroad. The outfall for the storm water is the Salt River.

There is a sag point in the profile of the proposed 78" storm drain at Station 133+50 that allows the storm drain to cross over the existing 66" sewer in Watkins Street. Crossing under the 66" sewer would result in a storm drain profile that is lower than the bottom of the Salt River. During final design of the storm drain, it shall be determined if a permanent pump will be required to drain the sag, or if the City would prefer to utilize portable pumps to drain the sag on an as needed basis. The cost for a permanent pump was not included in the cost estimate for the 7th Avenue Storm Drain.

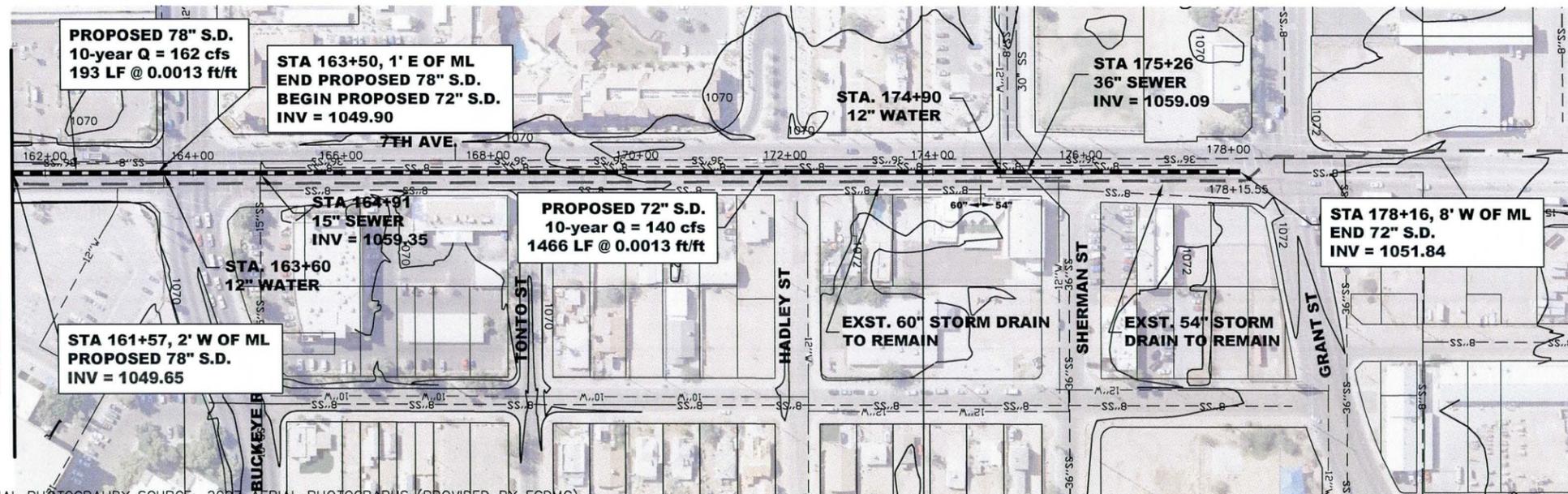
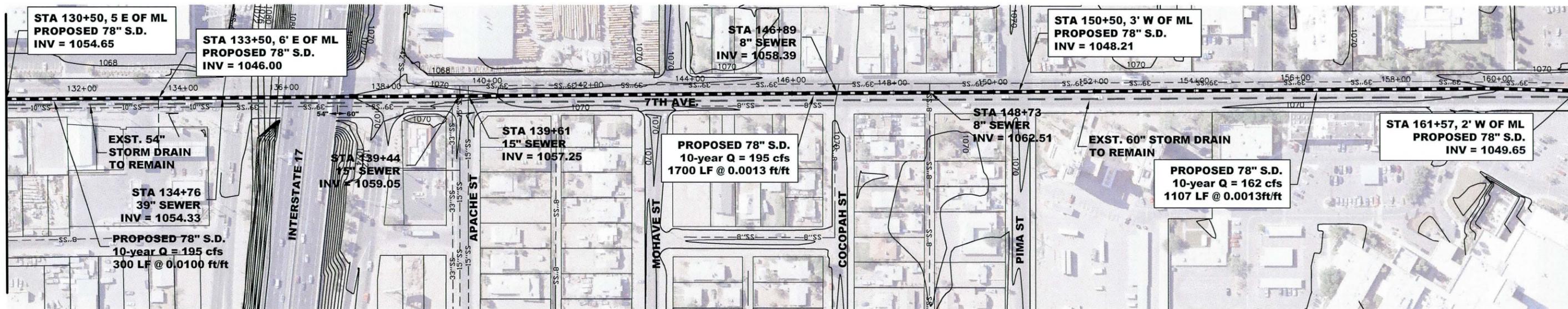
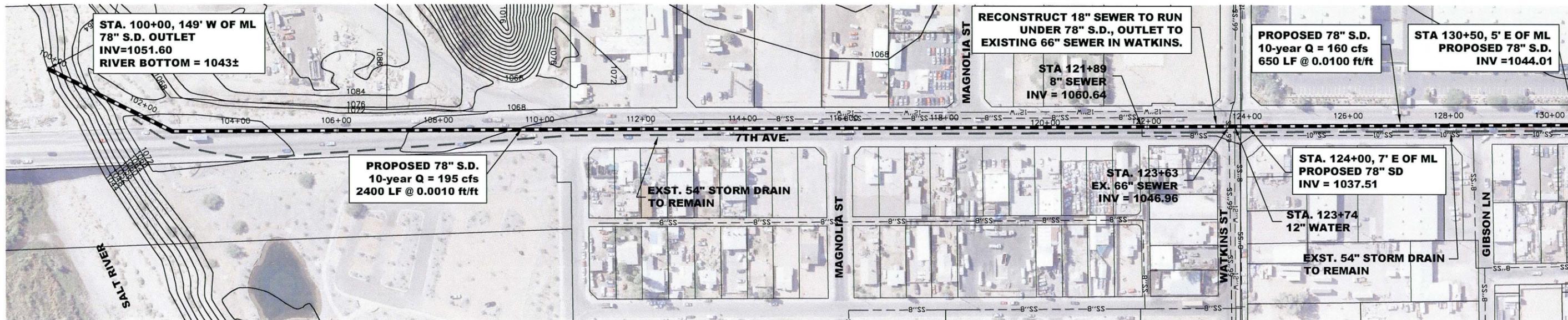


Design Elements/Constraints

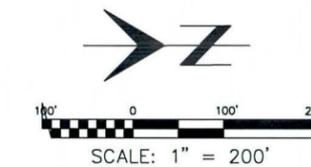
- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- During final design, if a permanent pump is not acceptable, then alternatives to the outlet should be considered.
- There is an existing 66-inch sanitary sewer line that runs from east to west in Watkins Street which is south of and parallel to I-17.
- Since this storm drain will be discharging within the Rio Salado river restoration project area, it will be important to minimize the impact that the outlet has on the River's habitat. Requirements for the design of the storm drain outlet will include: 1) restoring the habitat that is disturbed at the pipe outlet structure to its existing condition (which will probably be significantly dense by the time this storm drain is constructed), 2) providing trash racks at the outlets to prevent garbage from entering the habitat restoration area, and 3) providing dry weather crossings for the maintenance road which lies above the river bottom, running along the toe of slope of the river bank.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

7th Avenue Storm Drain					
Item No.	Item Description	Unit	Price	Quantity	Amount
1	72" SD in 7th Avenue, Buckeye to Grant STA. 163+50 to STA. 178+16	LF	\$869.15	1466	\$ 1,274,175
2	78" SD in 7th Avenue, Salt River to Buckeye STA. 100+00 to STA. 163+50	LF	\$931.64	6350	\$ 5,915,900
3	Special Structure	EA	\$50,000.00	1	\$ 50,000
Sub Total					\$ 7,240,075
Contingencies (20%)					\$ 1,448,015
TOTAL					\$ 8,688,100

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



Note: There is a sag point in the profile of the proposed 78" Storm Drain at Station 133+50 that allows the Storm Drain to cross over the existing 66" sewer in Watkins Street. Crossing under the 66" sewer would result in a Storm Drain profile that is lower than the bottom of the Salt River. During final design of the storm drain, it shall be determined if a permanent pump will be required to drain the sag, or if the City would prefer to utilize portable pumps to drain the sag on an as needed basis. The cost for a permanent pump was not included in the cost estimate for the 7th Avenue Storm Drain.



DOWNTOWN AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

SEVENTH AVE STORM DRAIN
 SALT RIVER TO GRANT ST

PLAN SHEET
 STA. 100+00 to STA. 178+37

SHEET OF
 01 01

APPENDIX U
MODIFICATIONS TO 11TH AND 15TH AVENUE STORM DRAIN

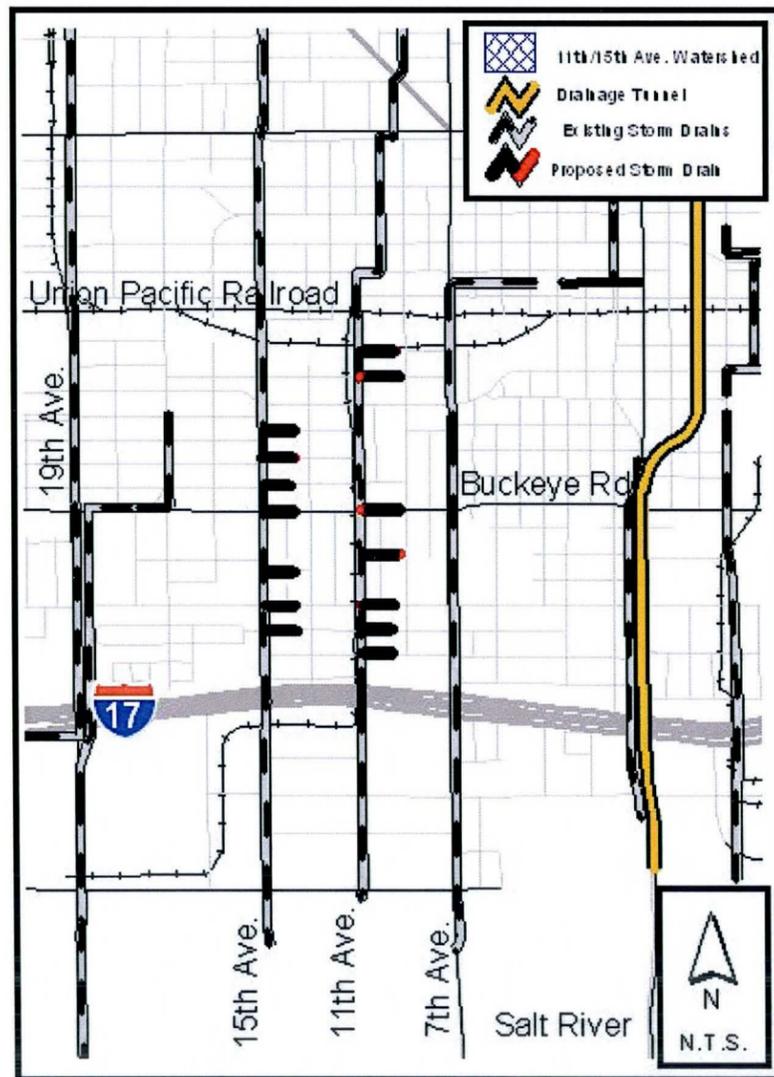
Add Inlets to 11th Avenue and 15th Avenue Storm Drains – 10-year Storm Drain

The project is the installation of new inlets and laterals on the existing 11th Avenue and 15th Avenue storm drains. The existing storm drains will have excess capacity because of the existing and proposed upstream diversions. These storm drains are conveying flow from north of the Union Pacific Railroad but have capacity left over to convey the 10-year runoff from the watershed south of the Railroad. The contributing watershed is between 15th Avenue and 7th Avenue, from I-17 to the Railroad.

The existing 11th Avenue and 15th Avenue storm drains will have up to fourteen new laterals located on adjacent streets. The laterals will have large storm drain inlets with the intent of providing 10-year interception capacity and conveyance of storm water into the existing 11th Avenue and 15th Avenue storm drains. The laterals and inlets are located on the side streets and the lengths depend upon conditions found on each street.

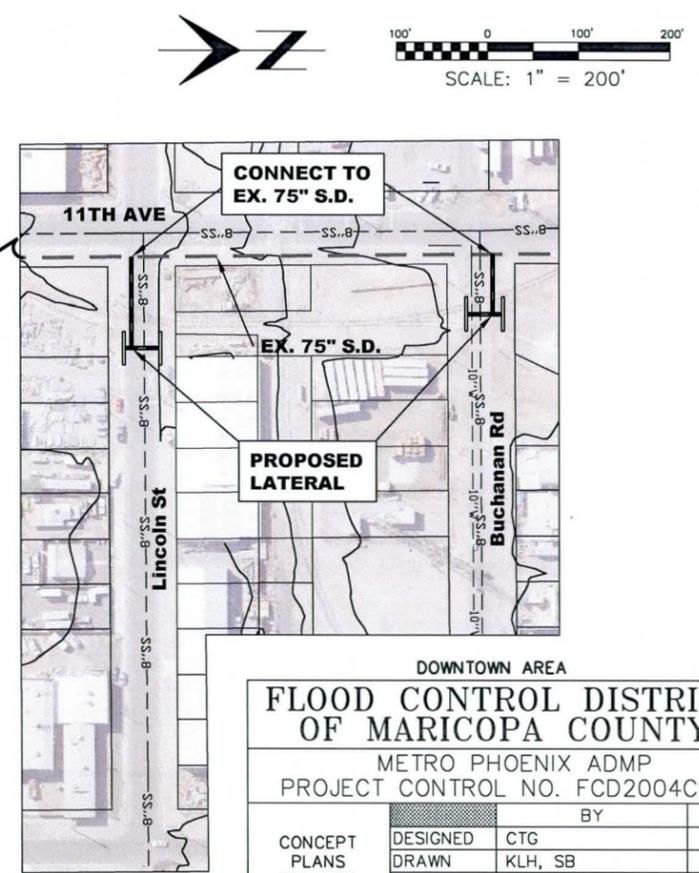
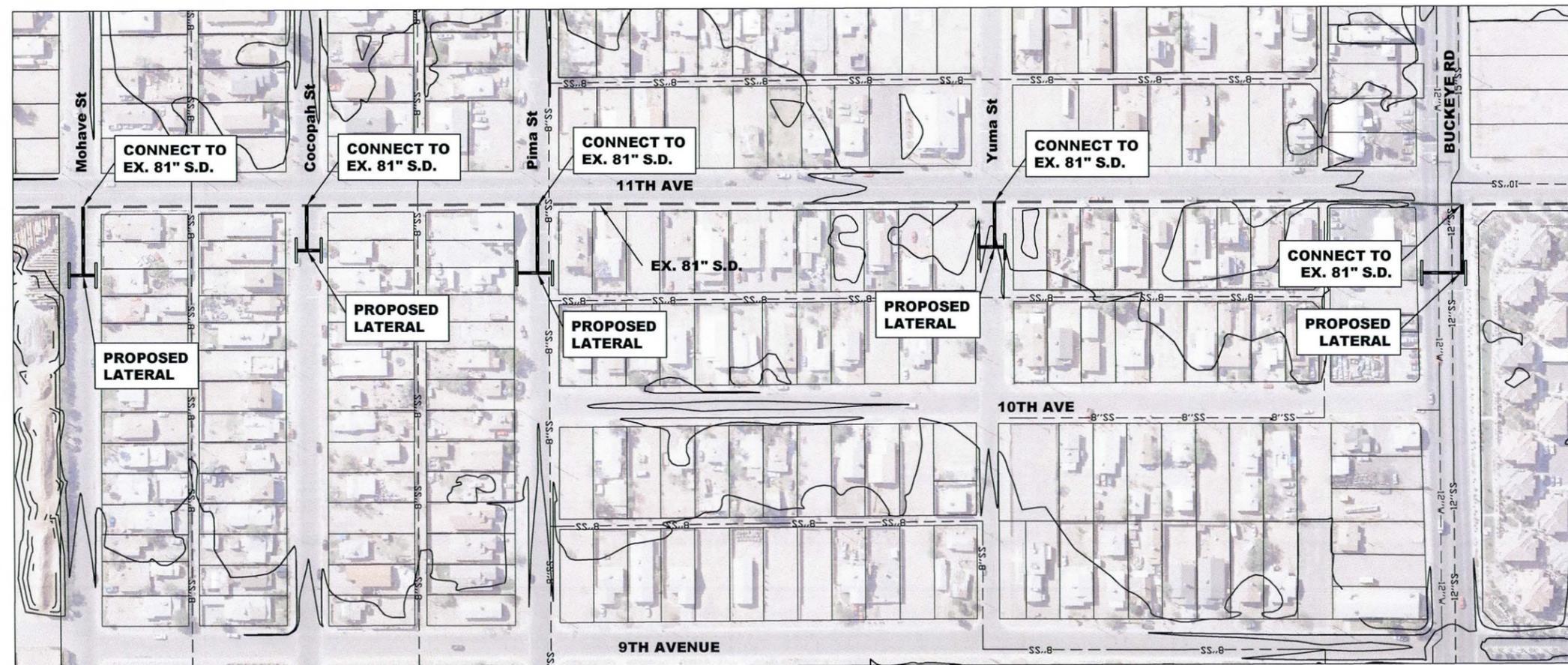
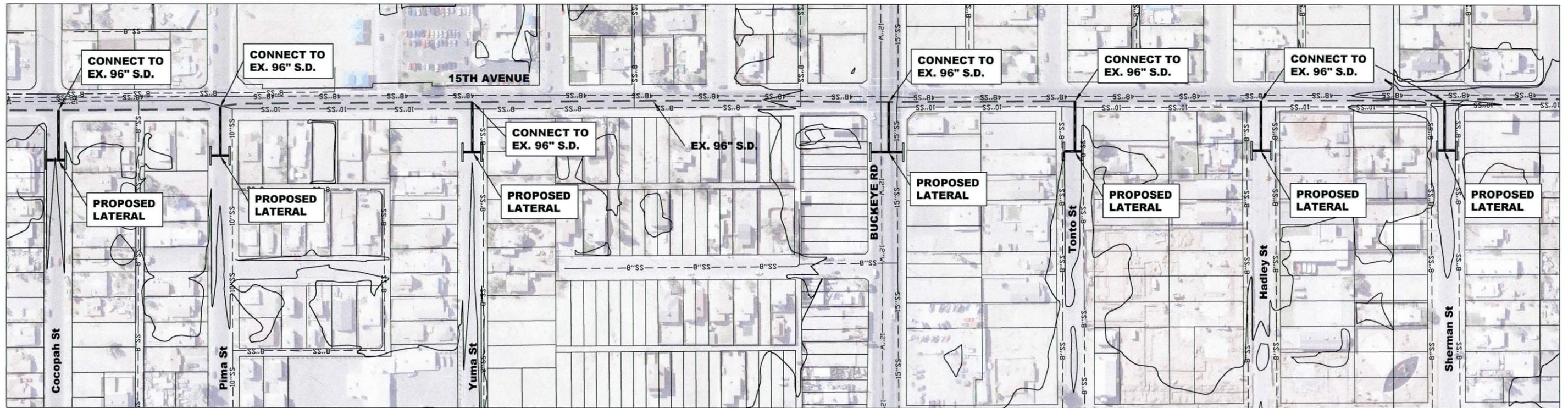
Design Elements/Constraints

- A drainage study will be required with the final design to determine locations and sizes for new catch basins and laterals in order to make sure that the 10-year runoff is collected for the entire watershed.
- Take advantage of the excess capacity of the existing storm drains by increasing storm water collection through adding new inlets and laterals.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAC sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).



11th and 15th Avenue Laterals					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	New Inlets on Existing 11th & 15th Ave. SD - Includes Connector Pipe	EA	\$10,000.00	28	\$ 280,000
2	New 30" Storm Drain Laterals on Existing 11th and 15th Ave. SD	LF	\$420.11	1400	\$ 588,148
Sub Total					\$ 868,148
Contingencies (20%)					\$ 173,630
TOTAL					\$ 1,041,800

Note: The cost estimates are based on 100' long laterals unless a specific condition was being met.



DOWNTOWN AREA
FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

	BY	DATE
CONCEPT	CTG	09/08
PLANS	KLH, SB	09/08
NOT FOR CONSTRUCTION	LAV	09/08

15TH & 11TH AVE S.D. LATERALS

eec PLAN SHEET SHEET OF 01 01

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX V
STORAGE BASIN AT DURANGO CURVE

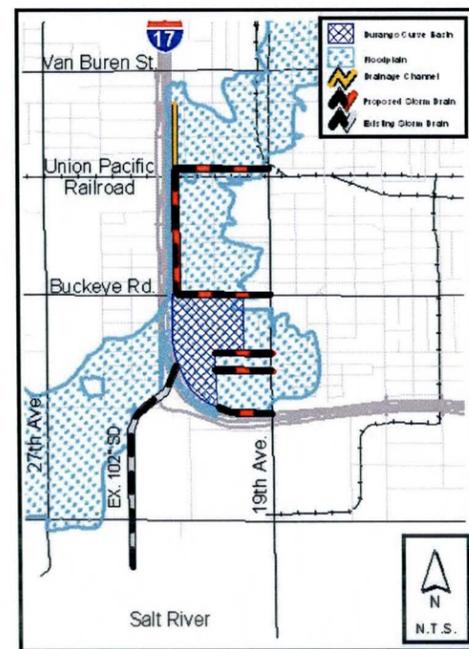
Regional Storage Basin at the Durango Curve – 100 Year Detention Basin

The Durango Curve is the concentration point for all flows within the Metro Phoenix area that do not discharge directly to the Salt River. This is also the primary point of concentration for all surface runoff from the Cave Creek Wash Floodplain and from the downtown area.

The plan is for a new drainage system to intercept, convey and discharge storm water into a new detention basin located in the Durango Curve area south of Buckeye Road adjacent to I-17. The drainage system is sized for the 100-year event for possible reduction or elimination of the 100-year floodplain. North of the Union Pacific Railroad there would be a new interception channel located adjacent to the frontage road that would collect flows from the Cave Creek Floodplain prior to spilling into the I-17 freeway. A new storm drain located in Jackson Street is used to divert flows from the existing 19th Avenue storm drain and convey that flow west to the interceptor channel. These flows would be combined and conveyed south along the I-17 frontage road in a new double barrel box culvert and discharges to the proposed regional detention basin located south of Buckeye Road. Flows will be diverted from ADOT’s existing 96-inch storm drain under I-17 at Buckeye Road to the proposed detention basin through a 12’ x 4’ box culvert.

The proposed detention basin’s outlet structure includes a headwall, double 10’ x 4’ box culverts, transition structure, and 102-inch storm drain to connect to ADOT’s existing 102-inch storm drain where it outlets to the Salt River. There will also be a smaller diameter collection system between the east side of the detention basin and 19th Avenue that will collect 10-year flows and discharge them into the basin; avoiding surface flow from eroding the basin side slopes.

To enhance the appeal of the regional detention facility, the 60-acre basin is designed with a multi-use function as a community park. Hamilton Elementary School and a County housing project lie adjacent to the new basin, providing recreational opportunities for local residents.



The detention basin is designed to detain the 100-year peak volume of 270 acre-feet at a peak stage of 1049.9 (NAVD 29). By comparison the low point in the I-17 frontage road is at an elevation of about 1052.0. The peak discharge out of the detention basin is 500 cfs. The park would only be inundated for about ten hours during the 100-year design flood. The metered outflow (peak of 500 cfs) will be conveyed to the Salt River in ADOT’s existing 102-inch storm drain.

Design Elements/Constraints

- The detention basin shall be designed for the 100-year flood, with the assumption that the proposed upstream 10-year storm drain systems are in place (i.e., the Cave Creek storm drain system including Palo Verde Golf Course and Encanto Golf Course, and the Downtown storm drain system).
- The hydrologic design of the detention basin is based on the assumption that I-10 represents the western drainage divide for the contributing watershed. However, a recent drainage study conducted by Dibble and Associates for the City’s

Aviation Department indicates that approximately 200cfs will flow westerly through I-10 at Buckeye Road. Therefore, in order for the Durango Curve Detention Basin to provide a 100-year level of service, an upstream solution will have to be implemented to prevent the 200cfs flow through I-10.

- The parking lots and restrooms shall be above the 100-year water surface elevation.
- There shall be a 10-year storm drain system installed on the east side and north side of the basin to intercept the local runoff from the area west of 15th Avenue and south of the railroad tracks.
- There shall be a new 100-year storm drain located in I-17 frontage road that collects flow from the Cave Creek floodplain, north of the Union Pacific Railroad, before it spills into I-17.
- ADOT’s 96” storm drain in I-17 shall be diverted into the basin.
- ADOT’s 102” storm drain shall be used to drain the basin.
- Several of the underlying properties at the basin site have been identified as hazardous materials sites. These sites have to be cleared prior to construction of the basin.
- Some of the homes that will have to be removed for the collection channel upstream of the Union Pacific Railroad may be historic structures. This will have to be coordinated during final design and historic homes shall be relocated prior to construction of the channel.
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMA sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).

Durango Curve		Unit	Unit Price	Quantity	Amount
Item No.	Item Description				
1	Purchase Land for Storage Basin	AC	\$400,000.00	60	\$ 24,000,000
2	Relocation, Admin. Costs (20% of Purchase Price)	LS	\$4,800,000.00	1	\$ 4,800,000
3	Demolish and Remove Buildings	AC	\$40,000.00	60	\$ 2,400,000
4	Purchase Land for Channel (18 parcels)	LS	\$1,627,800.00	1	\$ 1,627,800
5	Relocation, Admin. Costs (20% of Purchase Price)	LS	\$325,560.00	1	\$ 325,560
6	Drainage Excavation and Haul	CY	\$10.50	550000	\$ 5,775,000
7	Turf and Park Amenities	SF	\$3.50	2000000	\$ 7,000,000
8	Channel Construction	LF	\$100.00	1491	\$ 149,100
9	10' x 4' CBC	LF	\$1,375.93	6850	\$ 9,425,110
10	Junction Structure	EA	\$50,000.00	1	\$ 50,000
11	30" SD east side of Park	LF	\$420.11	3750	\$ 1,575,397
12	Buckeye Road, 10-year Storm Drain	LF	\$420.11	2300	\$ 966,243
13	78" SD in Jackson Street	LF	\$931.64	2300	\$ 2,142,767
14	Basin Outlet Structure (includes 100' of 102" SD, headwall, and 260' of 10' x 4' CBC)	EA	\$500,000.00	1	\$ 500,000
15	Proposed 36" Sanitary Sewer	LF	\$350.00	2600	\$ 910,000
16	Sewer Removal (8" and 27" Sewer)	LF	\$25.00	2100	\$ 52,500
17	Overhead Power line to Underground Powerline	LF	\$100.00	1000	\$ 100,000
Sub Total					\$ 61,799,477
Contingencies (20%)					\$ 12,359,895
TOTAL					\$ 74,159,400

Durango Basin Landscape Concept LANDSCAPE DESIGN GUIDELINES

Proposed Retention Basin with Recreation Complex

The redevelopment of this area from industrial land use to a floodwater storage and recreational open space would eliminate the Cave Creek floodplain, preclude flooding of the I-17 Freeway, provide an outfall for new upstream storm drains, provide needed recreational amenities, and enhance the visual character of the area

In conjunction with other upstream storm drain improvements, the Durango basin will provide storage for the 100-year flood.

Landscape Design Theme

The Suburban Park Recreational Complex Landscape Design Theme was chosen for the Durango basin based on input from the City Parks and Recreation Department's desire for needed sports fields in this area of the city, and input from citizens at the public meetings.

This theme consists of flood control structures that accentuate the natural topography and create landscape variety and visual interest. Surface treatments consist primarily of turf with inert materials in non-use areas. Plant materials consist of large shade trees with palms and shrubs as visual accents, which are appropriate for outdoor public recreation space.

Landscape and Recreation Design Guidelines

- Vary the basin slopes to enhance the park aesthetics while providing for the function of the storage basin. Site perimeter slopes should vary from a gentle 8:1 to a maximum 6:1, and include berming to break up the views into the basin. Maximum height of perimeter berms should be 4-feet, with 70% of the perimeter berms being 3-feet or less in height. Interior basin slopes should be varied, with a maximum being 6:1 on turf areas.
- Provide adequate perimeter viewing into the basin for safety and security.
- Provide north to south field orientation for daytime field use.
- Provide proper field drainage for everyday athletic use and to mitigate field recovery after large storm events.
- Provide high and dry areas for parking, restrooms, playgrounds, and general event staging.
- Provide for different levels of flooding and low flow channels to manage nuisance flows and smaller storms, to maximize the usability of the basin.
- Provide for accessibility throughout the park to comply with ADA.
- Provide adequate parking for anticipated event programming of the facility.
- The development of the basin as a sports complex shall meet the City Parks and Recreation Department's current policy for the type(s) of athletic field development.
- In addition to sports fields, provide alternative recreational amenities such as walking paths, playgrounds, ramadas, and possibly court sports.

- In combination with city zoning requirements, the design should strive to provide a typical 20-40 foot variable width setback from property lines and roadways to help provide a visual transition to the basins with surrounding streetscape and residential properties. Emphasis should be placed on providing the widest possible setback adjacent to residential properties with a minimum setback being 10 feet.

Durango Basin Park Recommended Plant Palette

Trees

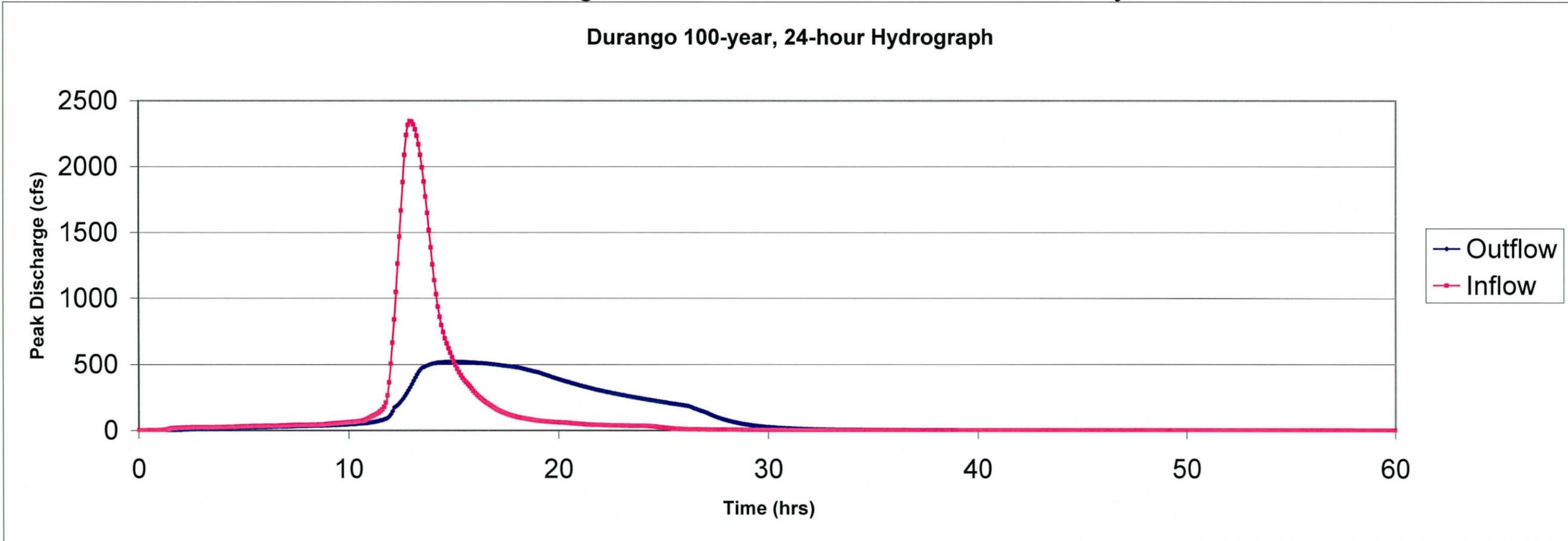
<u>Botanical Name</u>	<u>Common Name</u>
Proposed	
Acacia aneura	Mulga
Dalbergia sissoo	Sissoo
Prosopis chilensis	Thornless Mesquite
Quercus var.	Oak
Ulmus parviflora	Chinese Evergreen Elm
Eucalytus var.	Eucalytus
Pinus halepensis	Aleppo Pine
Pinus elderica	Mondel Pine

Shrubs

<u>Botanical Name</u>	<u>Common Name</u>
Proposed	
Leucophyllum var.	Sage
Nerium oleander petite	Petite Oleander
Muhlenbergia var.	Ornamental grass
Caesalpinia pulcherrima	Red Bird of Paradise
Bougainvillea var.	Bougainvillea
Tecoma stans	Yellowbells
Calliandra californica	Baja Fairy Duster
Hesperaloe var.	Hesperaloe
Baccharis hybrid	Baccharis
Lantana var.	Lantana

Durango Detention Basin Calculation Summary

Durango 100-year, 24-hour Hydrograph



Stage-Storage-Discharge Summary

	Peak									
Volume (acre-feet)	0	24	113	193	270	276	364	411	450	500
Elevation (feet)	1042	1044	1046	1048	1049.9	1050	1052	1053	1054	1055
Discharge (cfs)	0	177	320	467	520	524	549	562	575	2224

Note: Spills into frontage Road at elevation 1052 and spills over I-17 at elevation 1054.

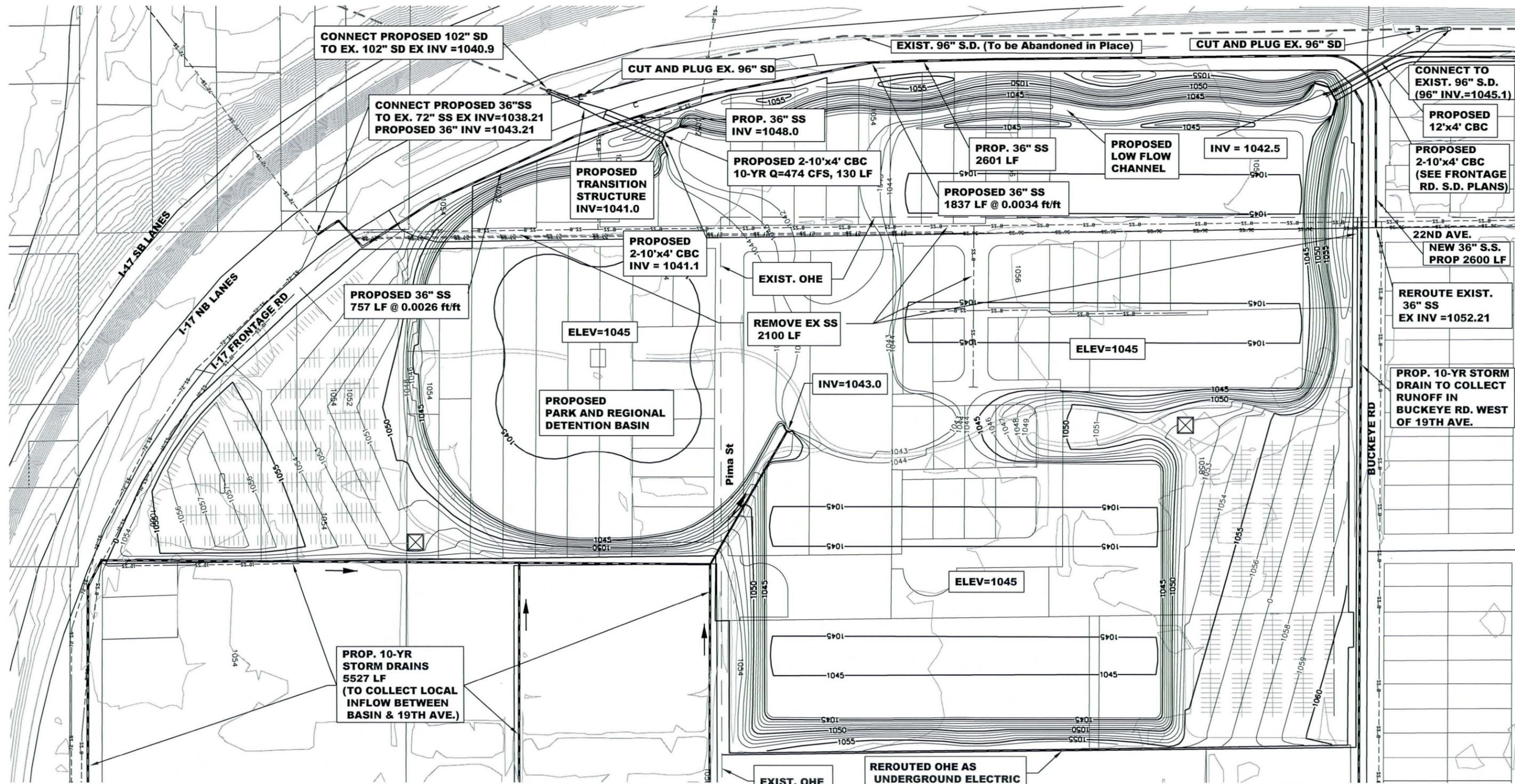
Volume Calculation

Contour	area	area	depth	Volume	Accumulative
Elevation	[ft ²]	[acres]	[ft]	[acre-ft]	[acre-ft]
1042	91208	2	0	0.0	0
1043	216131	5	1	3.4	3
1044	1870527	43	1	20.8	24
1045	2095650	48	1	45.5	70
1046	1705528	39	1	43.6	113
1047	1737967	40	1	39.5	153
1048	1772669	41	1	40.3	193
1049	1808127	42	1	41.1	234
1050	1859103	43	1	42.1	276
1051	1917531	44	1	43.3	320
1052	1988335	46	1	44.8	365
1053	2069480	48	1	46.6	411

Stage/Volume versus Time

Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume	Time (hrs)	Stage	Volume
0	1042	0.0	9	1042.4	5.3	18	1048.4	209.0
1	1042	0.0	10	1042.5	6.4	19	1047.6	178.3
2	1042.1	0.8	11	1042.7	8.0	20	1046.9	156.0
3	1042.2	1.9	12	1043.4	16.7	21	1046.3	124.4
4	1042.2	2.4	13	1046.4	129.9	22	1045.7	101.8
5	1042.3	3.1	14	1049.4	251.2	23	1045.3	81.3
6	1042.3	3.7	15	1049.9	270.0	24	1044.9	63.2
7	1042.4	4.2	16	1049.6	261.4	25	1044.5	47.0
8	1042.4	4.7	17	1049.1	239.6	26	1044.2	31.5

Note: The fields are set at elevation 1045.



CONNECT PROPOSED 102" SD TO EX. 102" SD EX INV =1040.9

CONNECT PROPOSED 36"SS TO EX. 72" SS EX INV=1038.21
PROPOSED 36" INV =1043.21

CUT AND PLUG EX. 96" SD

PROP. 36" SS INV =1048.0

PROPOSED 2-10'x4' CBC 10-YR Q=474 CFS, 130 LF

PROP. 36" SS 2601 LF

PROPOSED LOW FLOW CHANNEL INV = 1042.5

PROPOSED 36" SS 1837 LF @ 0.0034 ft/ft

CONNECT TO EXIST. 96" S.D. (96" INV.=1045.1)

PROPOSED 12'x4' CBC

PROPOSED 2-10'x4' CBC (SEE FRONTAGE RD. S.D. PLANS)

PROPOSED TRANSITION STRUCTURE INV=1041.0

PROPOSED 2-10'x4' CBC INV = 1041.1

EXIST. OHE

REMOVE EX SS 2100 LF

PROPOSED 36" SS 757 LF @ 0.0026 ft/ft

ELEV=1045

ELEV=1045

22ND AVE. NEW 36" S.S. PROP 2600 LF

REROUTE EXIST. 36" SS EX INV =1052.21

PROPOSED PARK AND REGIONAL DETENTION BASIN

INV=1043.0

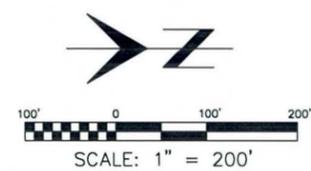
PROP. 10-YR STORM DRAIN TO COLLECT RUNOFF IN BUCKEYE RD. WEST OF 19TH AVE.

PROP. 10-YR STORM DRAINS 5527 LF (TO COLLECT LOCAL INFLOW BETWEEN BASIN & 19TH AVE.)

ELEV=1045

EXIST. OHE

REROUTED OHE AS UNDERGROUND ELECTRIC



DURANGO CURVE STORAGE BASIN / RECREATION COMPLEX

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	DATE
	DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08	

DURANGO CURVE STORAGE BASIN / RECREATION COMPLEX

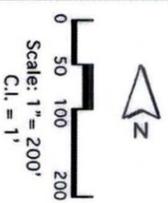


PLAN SHEET SHEET OF 01 01

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)



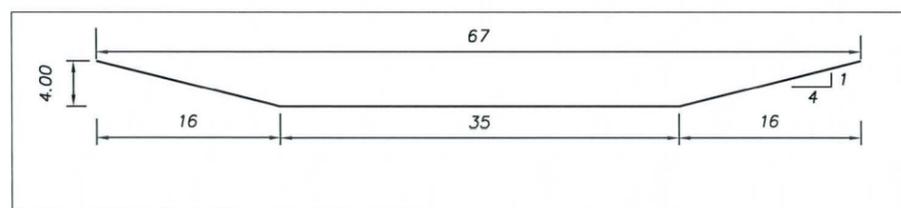
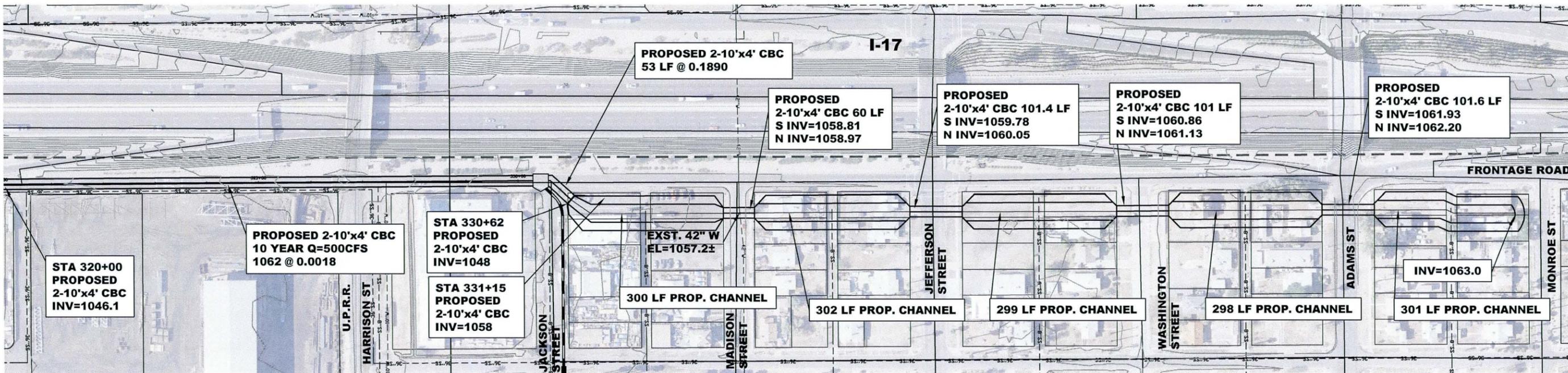
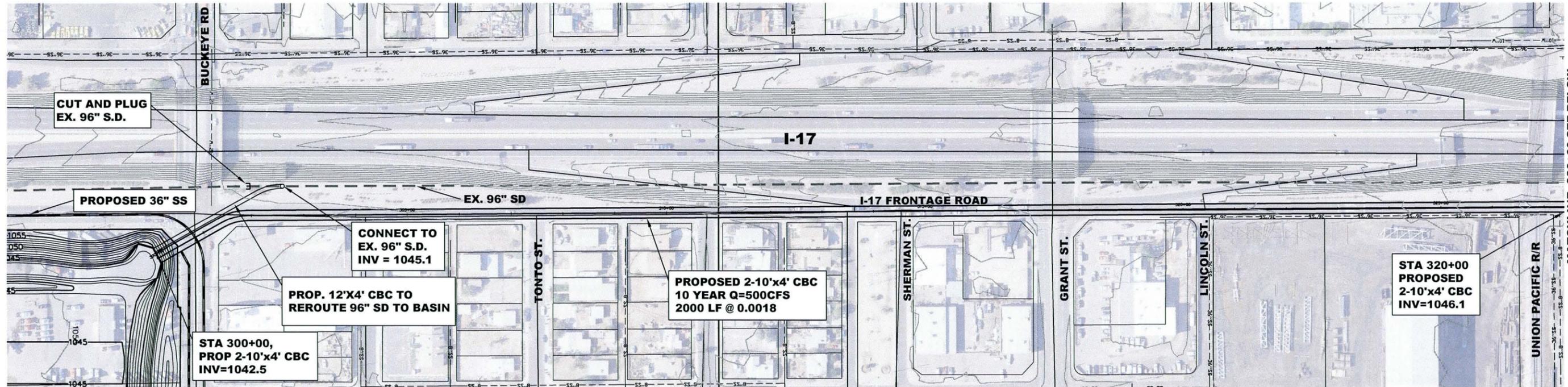
Metro Phoenix ADMP - Recommended Plan
 Durango Curve
 100-year Storage Basin/ Recreation Complex
 Concept Landscape Design



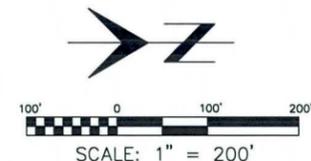
Engineering and Environmental
 Consultants, Inc. 140
 7878 N. Central Ave. Suite 1500
 Phoenix, Arizona 85020

Gayan & Barker
 Inc. 150
 3033 N. Central Ave. Suite 1500
 Phoenix, Arizona 85018

Arizona Flood Control District
 of Maricopa County



TYPICAL CHANNEL SECTION



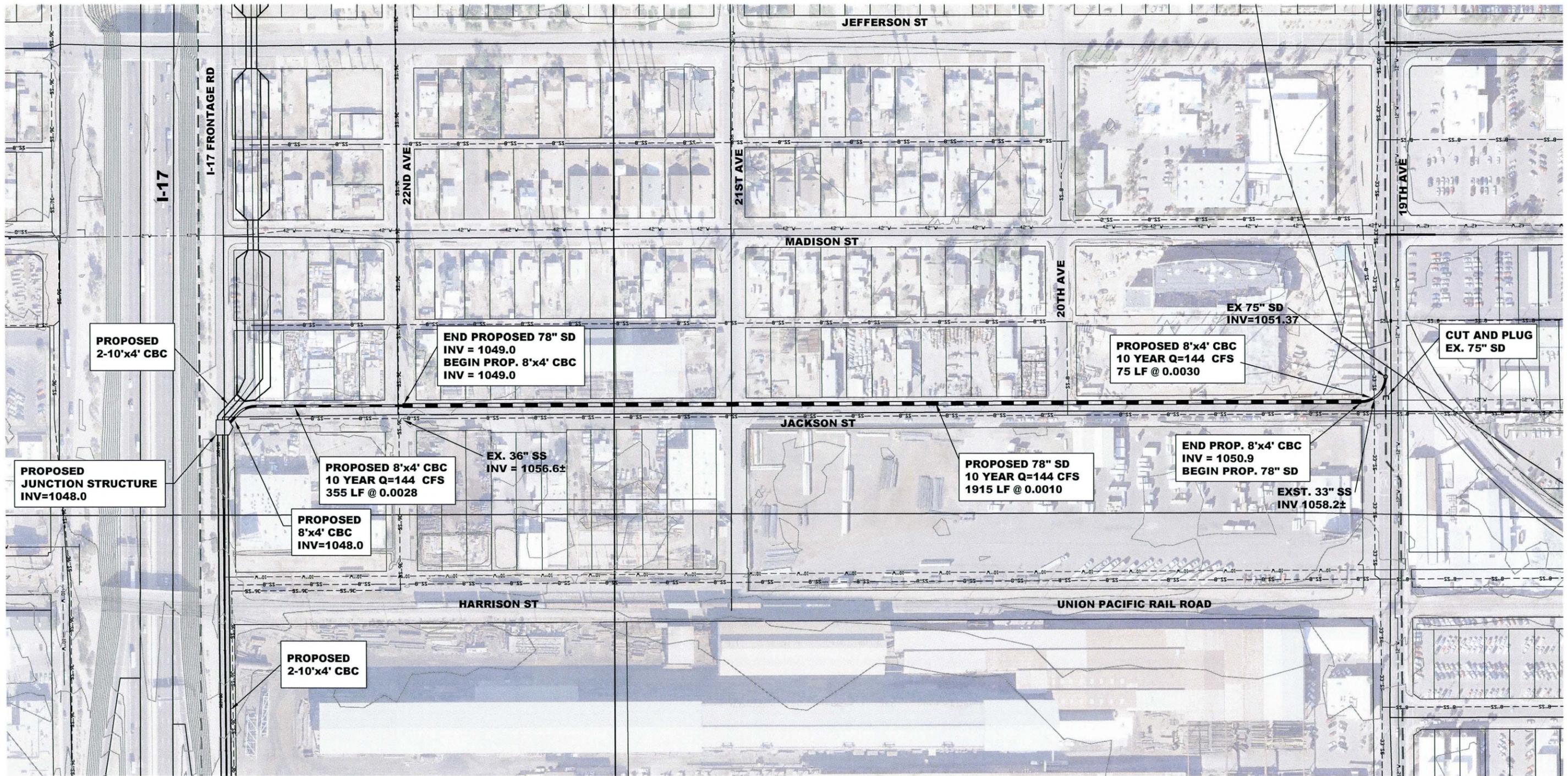
DURANGO CURVE FRONTAGE ROAD S.D.

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08
FRONTAGE ROAD STORM DRAIN AND CHANNEL			
PLAN SHEET			SHEET OF 01 02

ecc



PROPOSED
2-10'x4' CBC

PROPOSED
JUNCTION STRUCTURE
INV=1048.0

PROPOSED
8'x4' CBC
INV=1048.0

PROPOSED
2-10'x4' CBC

PROPOSED 8'x4' CBC
10 YEAR Q=144 CFS
355 LF @ 0.0028

END PROPOSED 78" SD
INV = 1049.0
BEGIN PROP. 8'x4' CBC
INV = 1049.0

EX. 36" SS
INV = 1056.6±

PROPOSED 78" SD
10 YEAR Q=144 CFS
1915 LF @ 0.0010

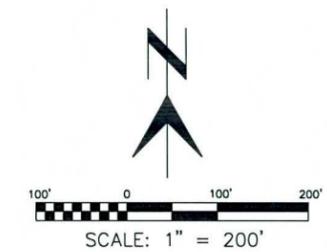
END PROP. 8'x4' CBC
INV = 1050.9
BEGIN PROP. 78" SD

EXST. 33" SS
INV 1058.2±

PROPOSED 8'x4' CBC
10 YEAR Q=144 CFS
75 LF @ 0.0030

EX 75" SD
INV=1051.37

CUT AND PLUG
EX. 75" SD



DURANGO CURVE JACKSON STREET S.D.				
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY				
METRO PHOENIX ADMP PROJECT CONTROL NO. FCD2004C040				
CONCEPT PLANS NOT FOR CONSTRUCTION	DESIGNED	CTG	BY	DATE
	DRAWN	KLH, SB		09/08
	CHECKED	LAV		09/08
JACKSON STREET SD				
		PLAN SHEET	SHEET OF 02 02	

ARCADIA AREA

CAMELBACK ROAD

INDIAN SCHOOL ROAD

THOMAS ROAD

40TH STREET

48TH STREET

56TH STREET

64TH STREET

ARIZONA CANAL

**ARCADIA AREA
STORM DRAIN SYSTEM
(Appendix X)**

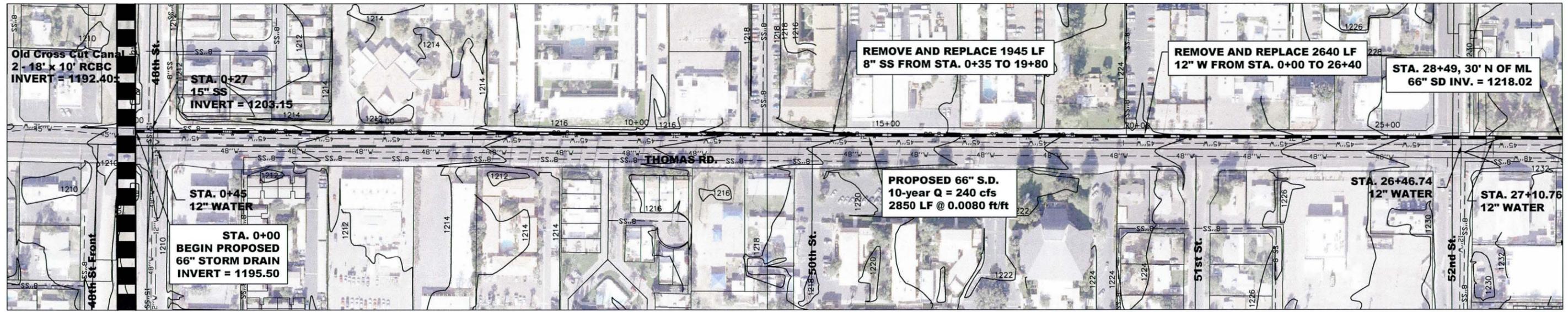
**THOMAS ROAD STORM DRAIN
(Appendix W)**



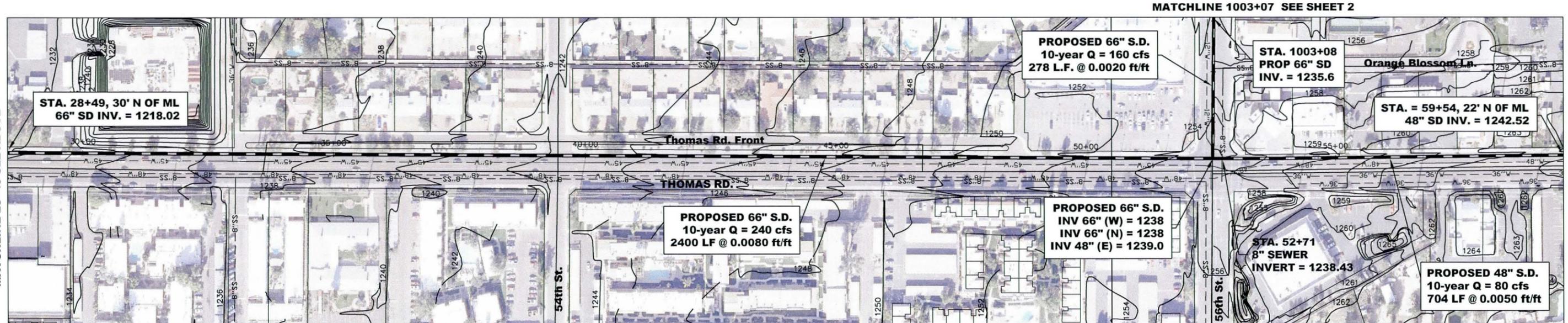
**NOTE: COLORED AREAS REPRESENT
WATERSHED BOUNDARIES FOR EACH
PROJECT IDENTIFIED THEREON**



APPENDIX W
THOMAS ROAD STORM DRAIN
Old Cross Cut Canal to 62nd St.

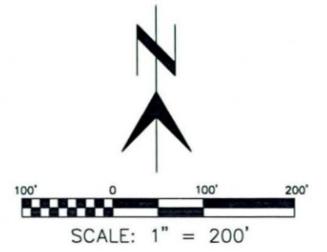


MATCHLINE 28+49 SEE BELOW



MATCHLINE 28+49 SEE ABOVE

MATCHLINE 59+54 SEE SHEET 2



ARCADIA AREA

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

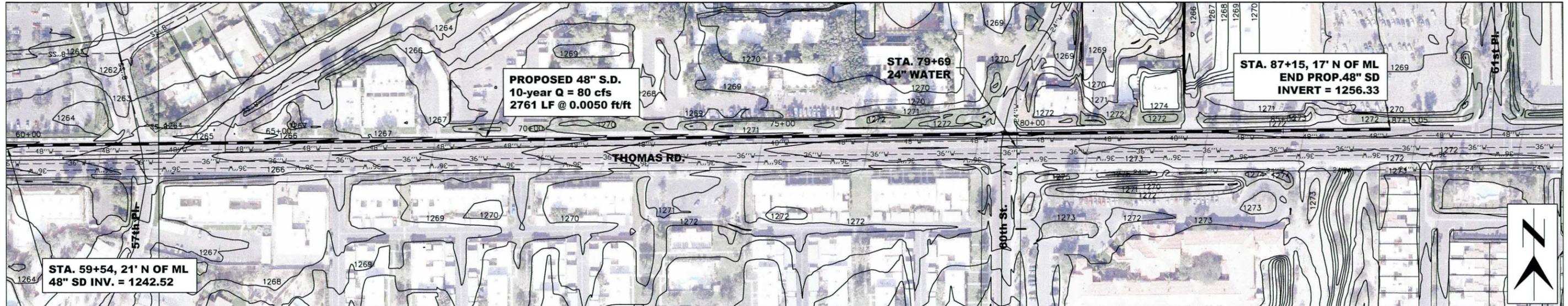
	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

THOMAS RD STORM DRAIN
48th St. to 56th St.

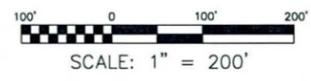
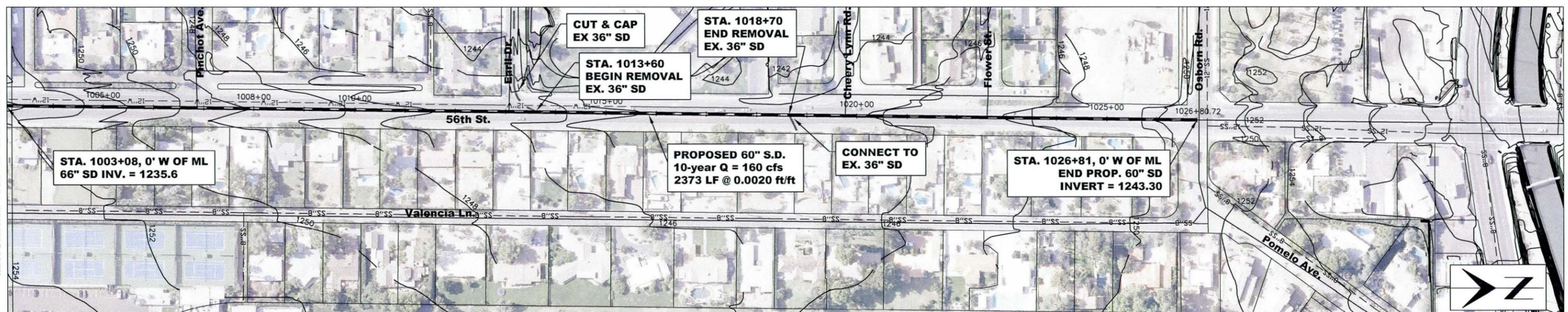
	PLAN SHEET STA. 00+00 to STA. 59+55	SHEET OF 01 02
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AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 59+54 SEE SHEET 1



MATCHLINE 1003+07 SEE SHEET 1



ARCADIA AREA
**FLOOD CONTROL DISTRICT
 OF MARICOPA COUNTY**

METRO PHOENIX ADMP
 PROJECT CONTROL NO. FCD2004C040

CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08

**THOMAS RD STORM DRAIN
 56th St. to 60th St.**

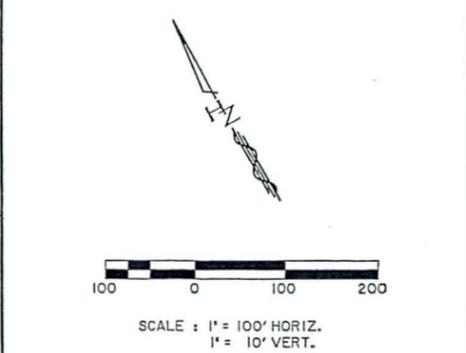
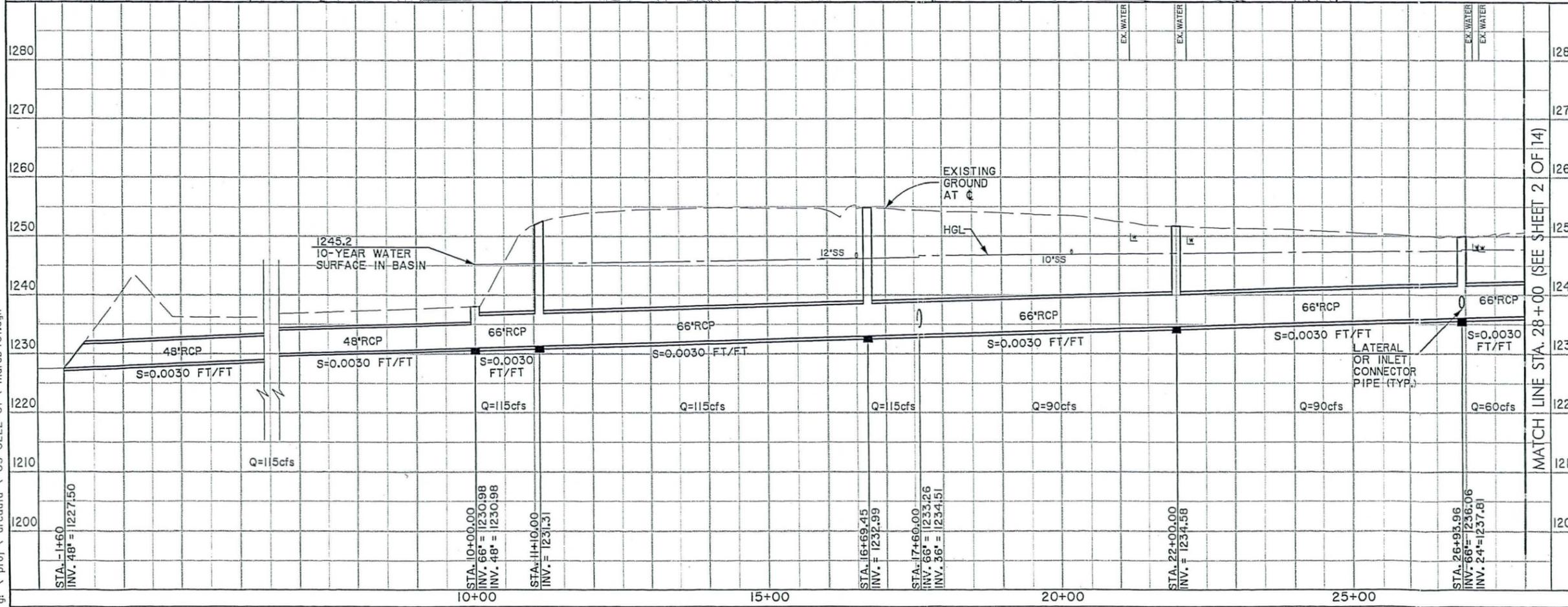
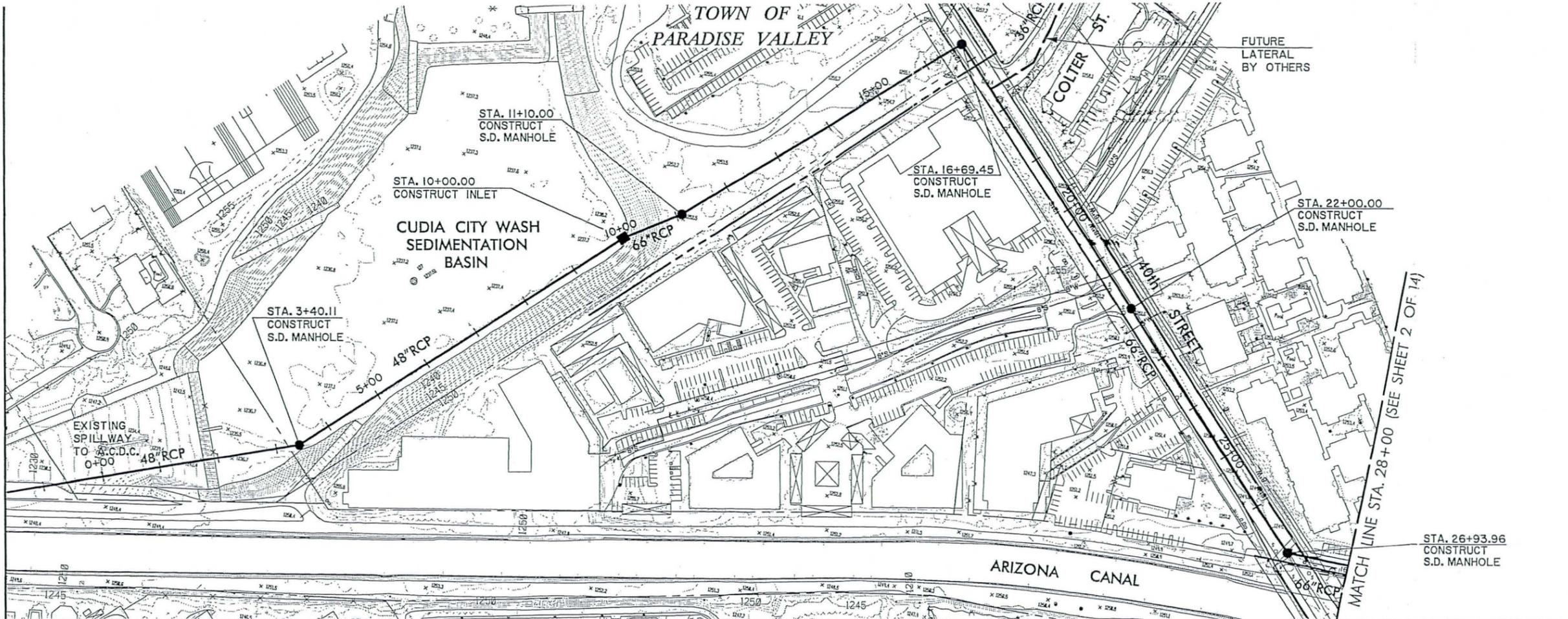
	PLAN SHEET	SHEET OF
	STA. 59+55 to STA. 87+15	02 02

AERIAL PHOTOGRAPHY SOURCE: 2007 AERIAL PHOTOGRAPHS (PROVIDED BY FCDMC)
 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

APPENDIX X
ARCADIA AREA STORM DRAIN SYSTEM (Huitt-Zollars Alternate 2)

TOWN OF PARADISE VALLEY

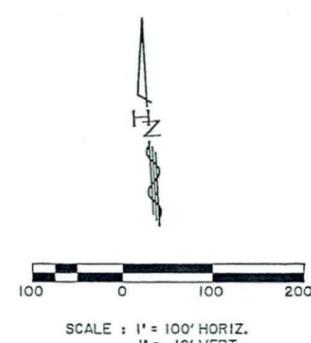
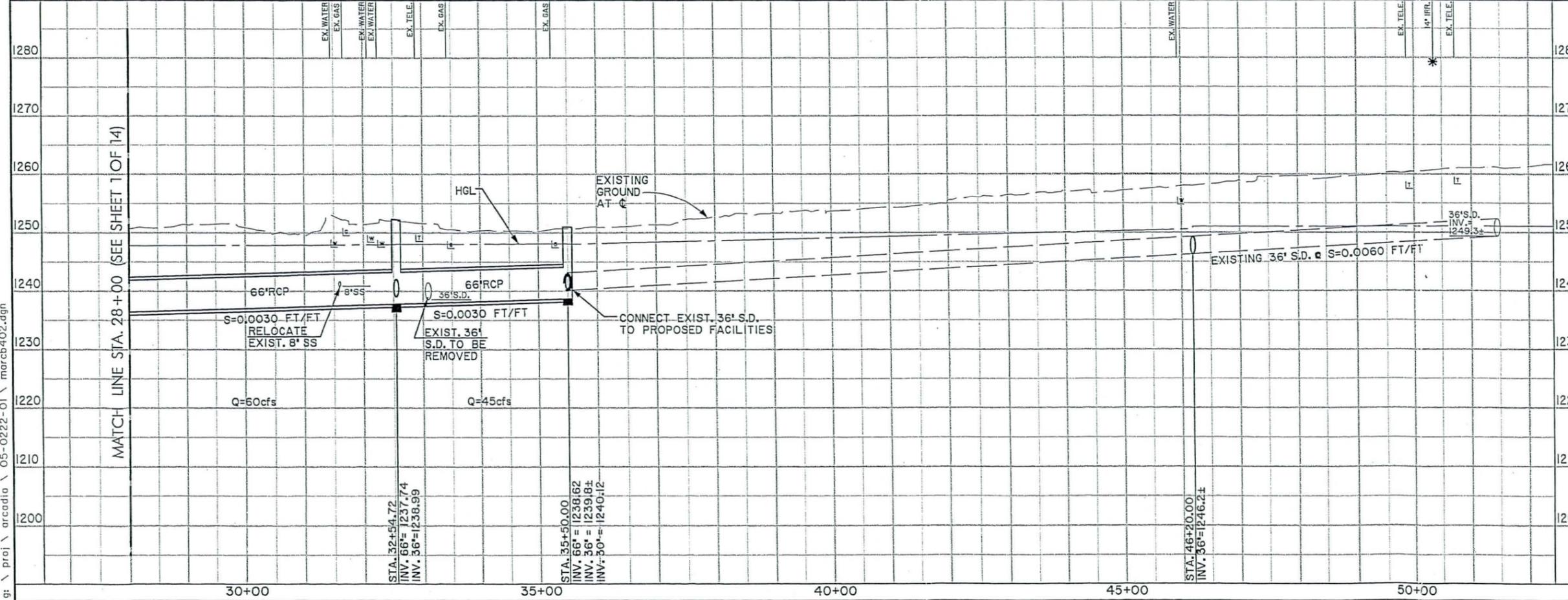
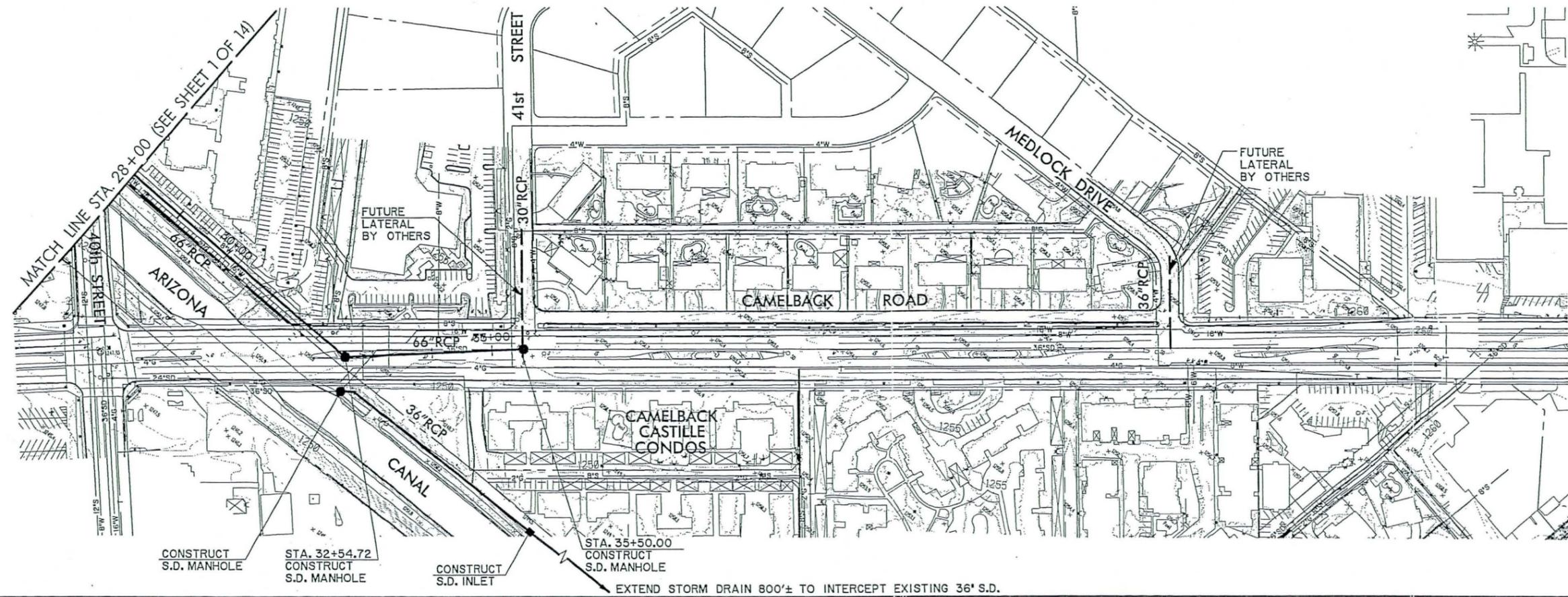
NOTE: UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.
*



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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
	DESIGNED	J. GIRAND	03-97
	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
HUITT - ZOLLARS 6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8053			
ALTERNATE 2 CUDIA CITY WASH - 40th STREET - "WEST" CAMELBACK			SHEET 1 OF 14

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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

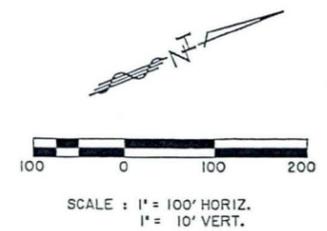
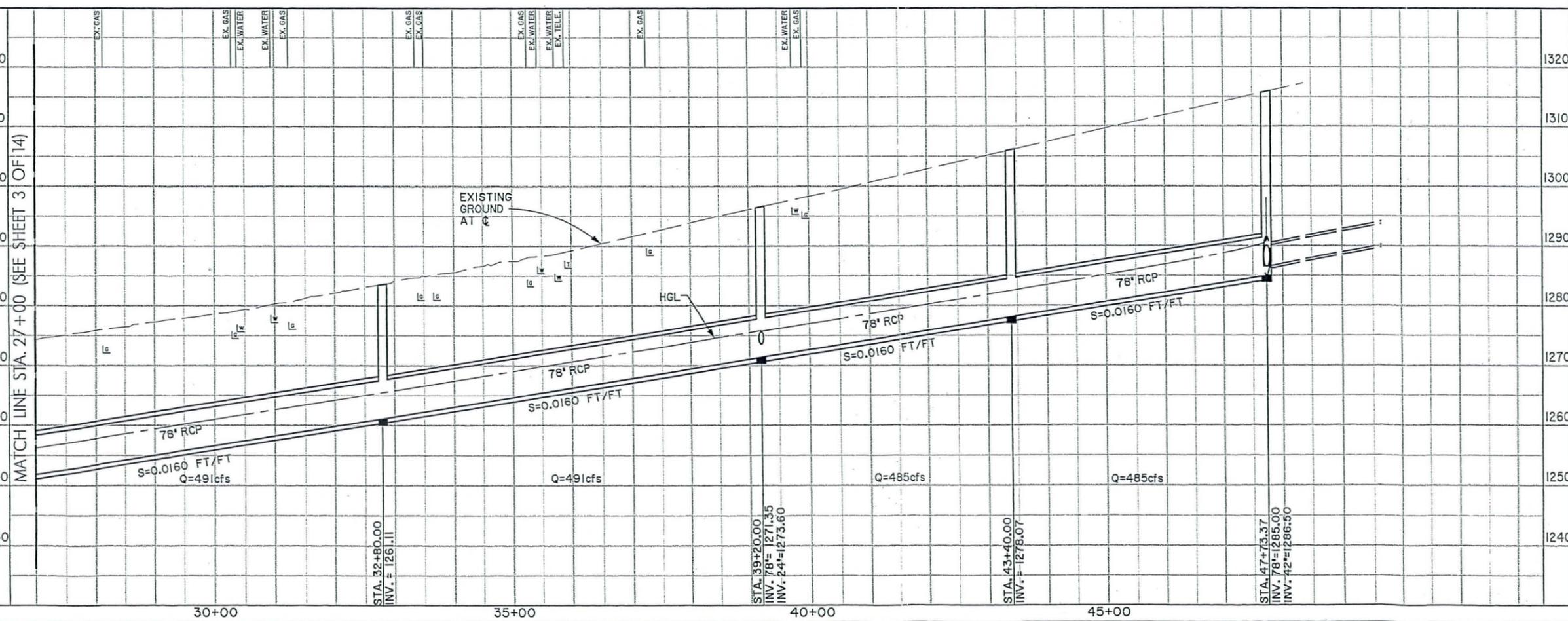
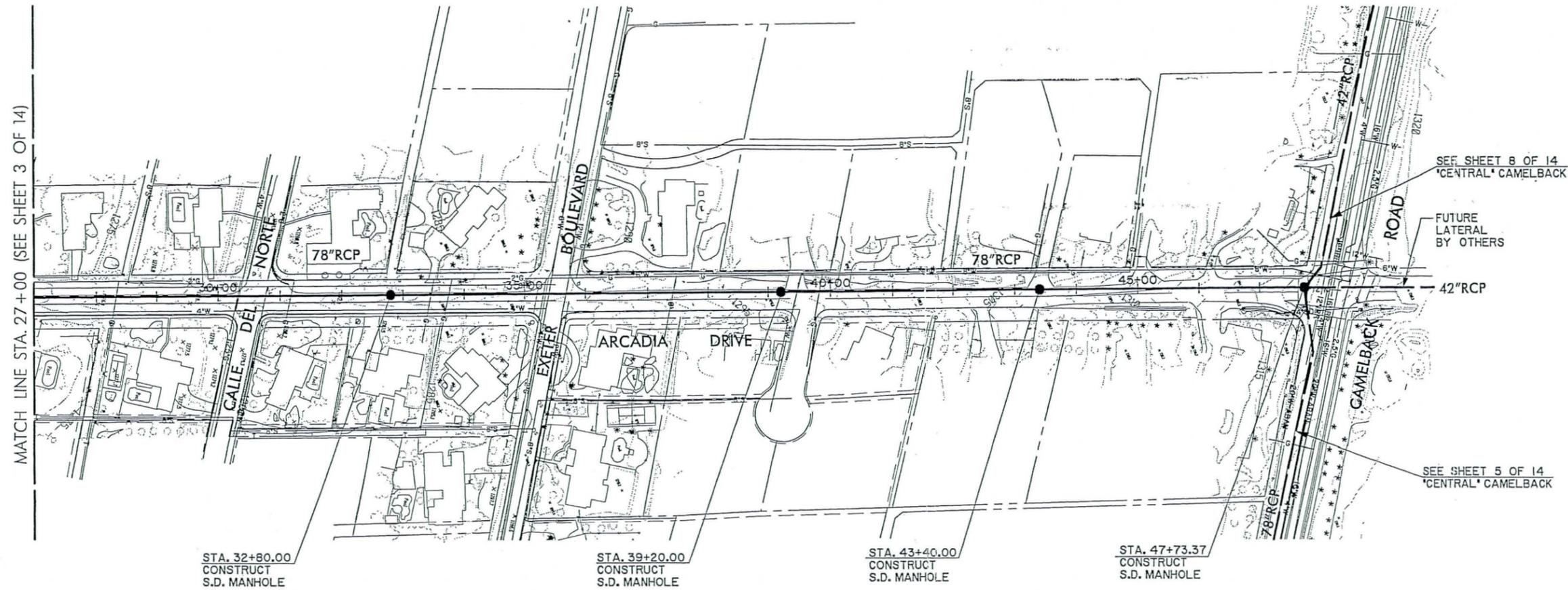


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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
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	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
HUITT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029</small> <small>(602) 381-0125 FAX (602) 381-8053</small>			
ALTERNATE 2 CUDIA CITY WASH - 40th STREET - "WEST" CAMELBACK			SHEET 2 OF 14

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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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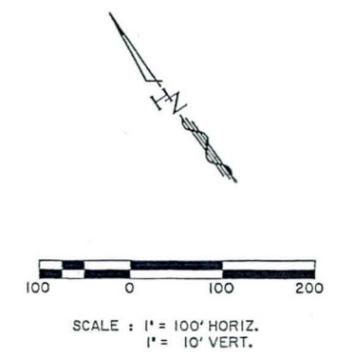
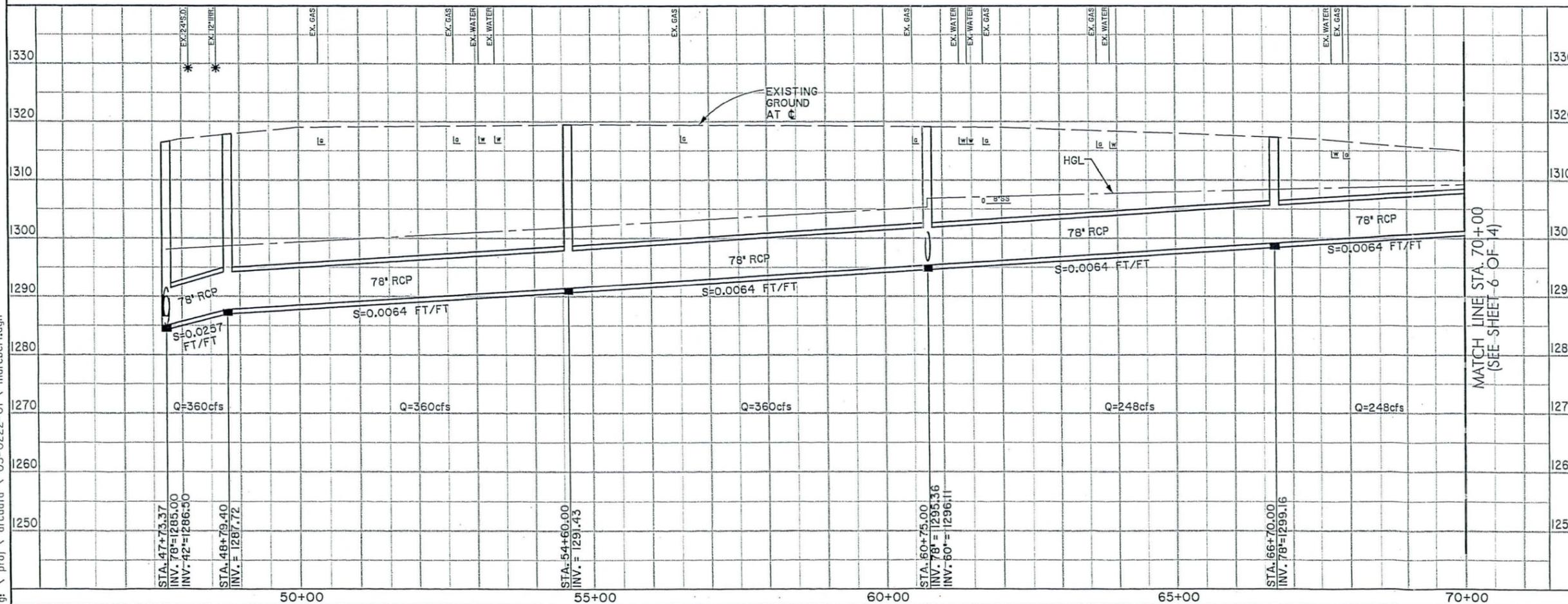
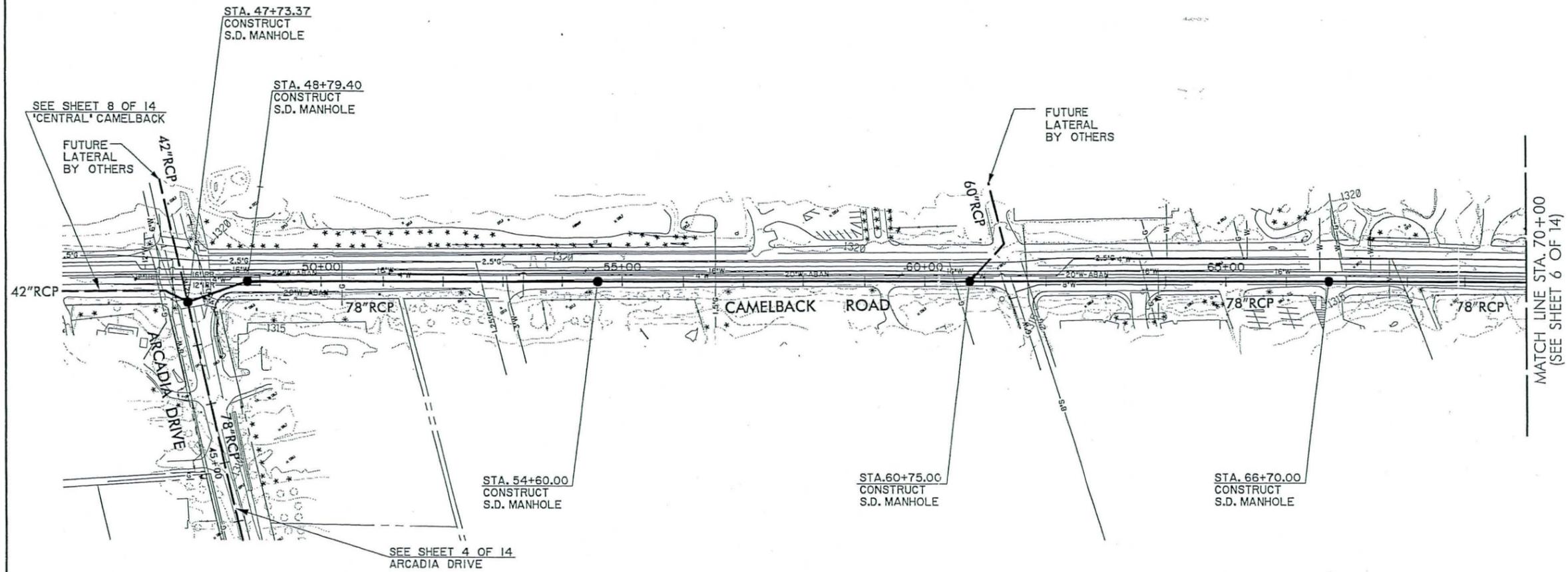


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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
	DESIGNED	J. GIRAND	03-97
	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
	HUIT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8033</small>		
ALTERNATE 2 ARCADIA DRIVE		SHEET 4 OF 14	

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NOTE: UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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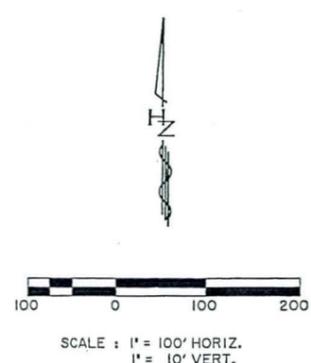
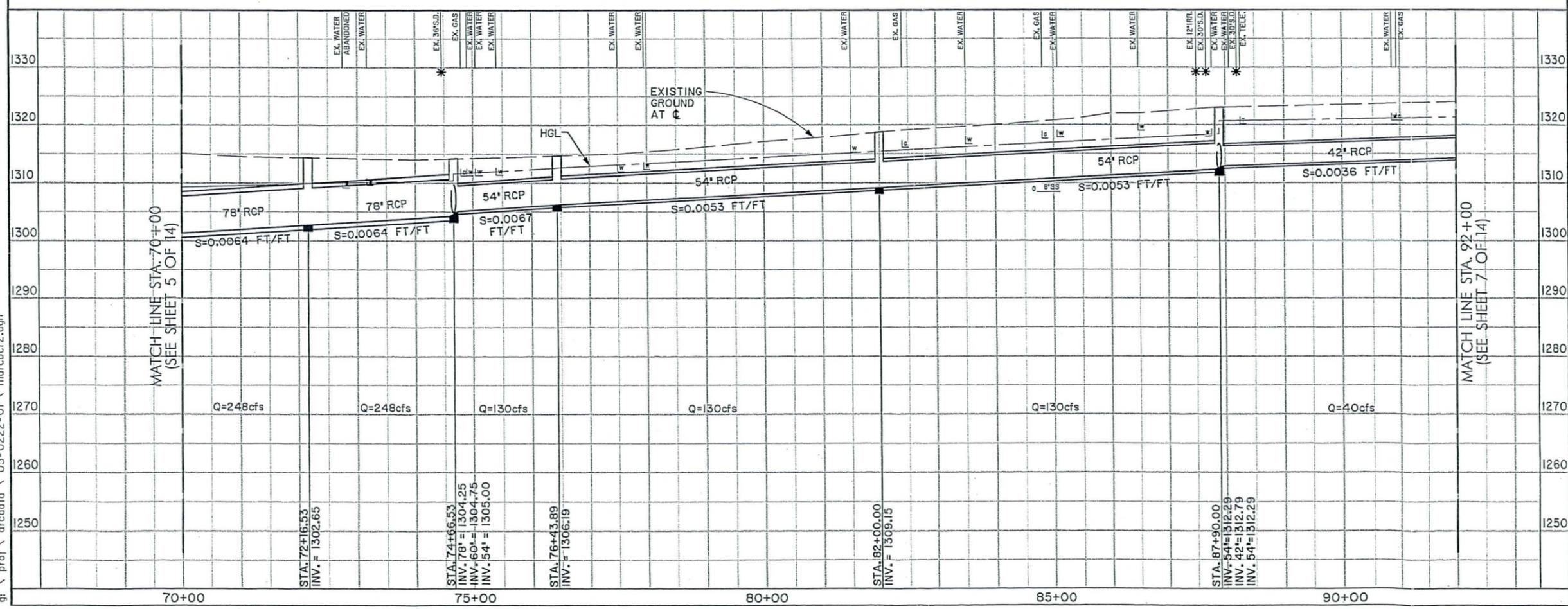
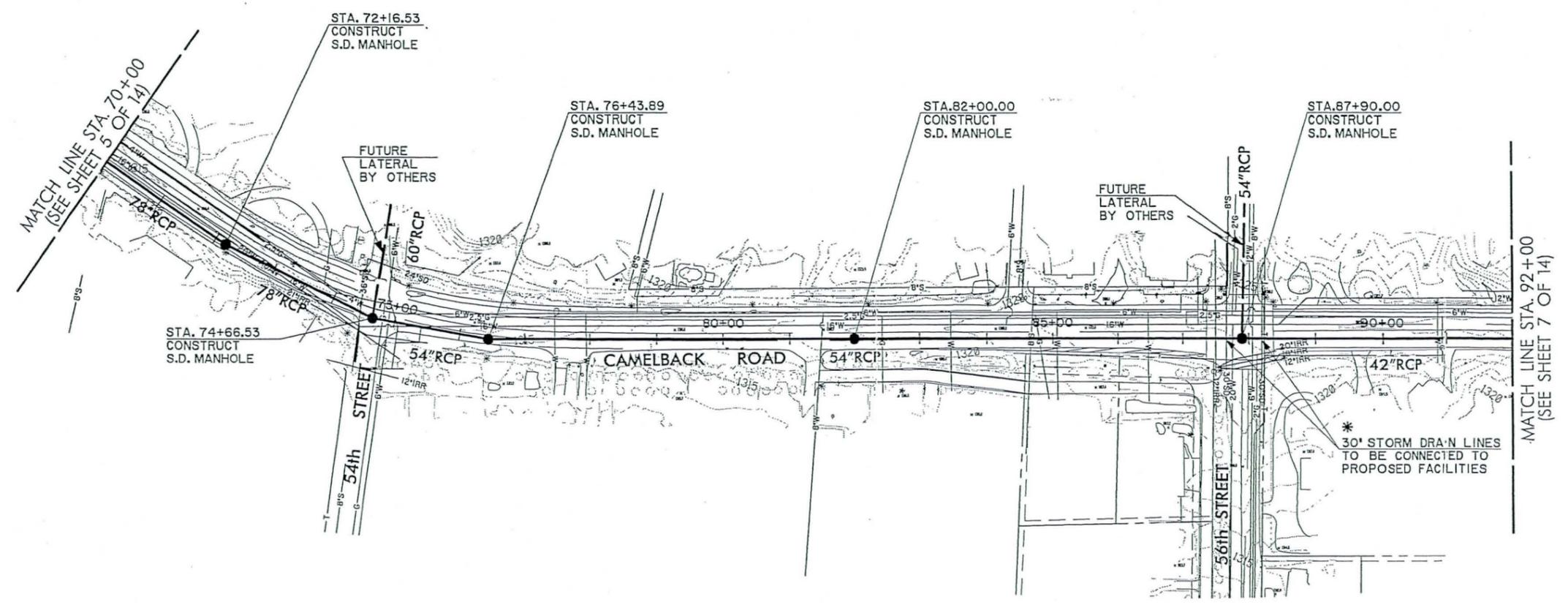


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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
		DESIGNED	J. GIRAND 03-97
		DRAWN	B. MCK. 03-97
CHECKED	R. WISE 03-97		
HUITT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85014-2029</small> <small>(602) 381-0125 FAX (602) 381-8053</small>			
ALTERNATE 2 "CENTRAL" CAMELBACK			SHEET 5 OF 14

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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

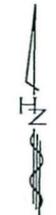
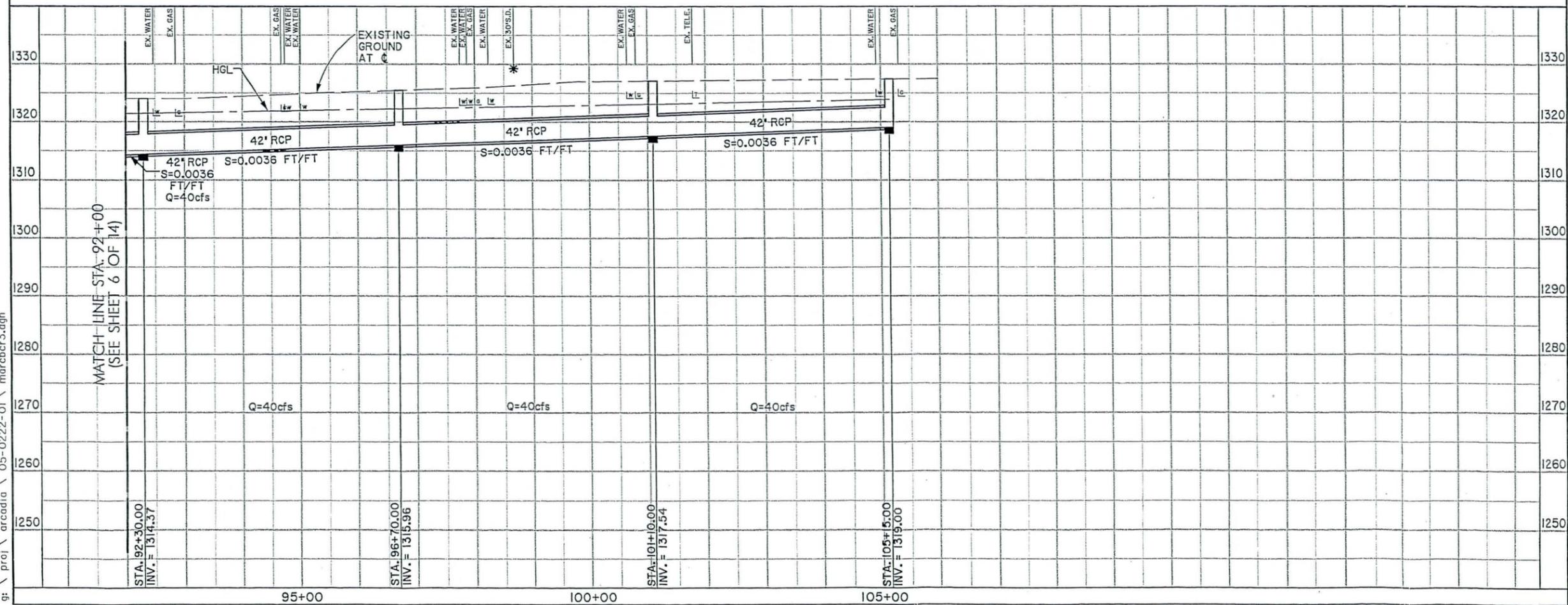
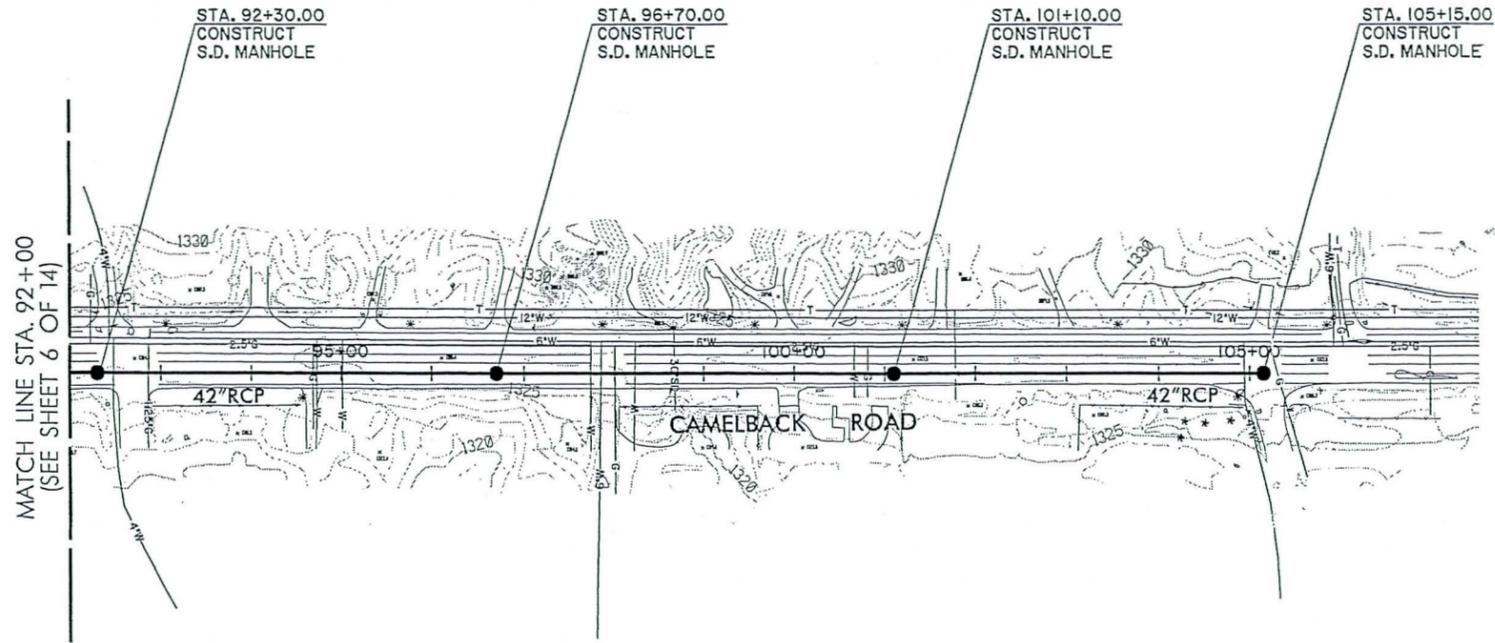
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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
	DESIGNED	J. GIRAND	03-97
	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
		BY	DATE
HUITT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029</small> <small>(602) 381-0125 FAX (602) 381-8033</small>			
ALTERNATE 2 "CENTRAL" CAMELBACK			SHEET 6 OF 14

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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.
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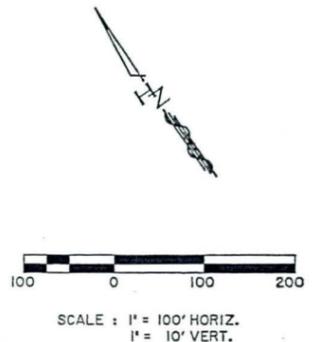
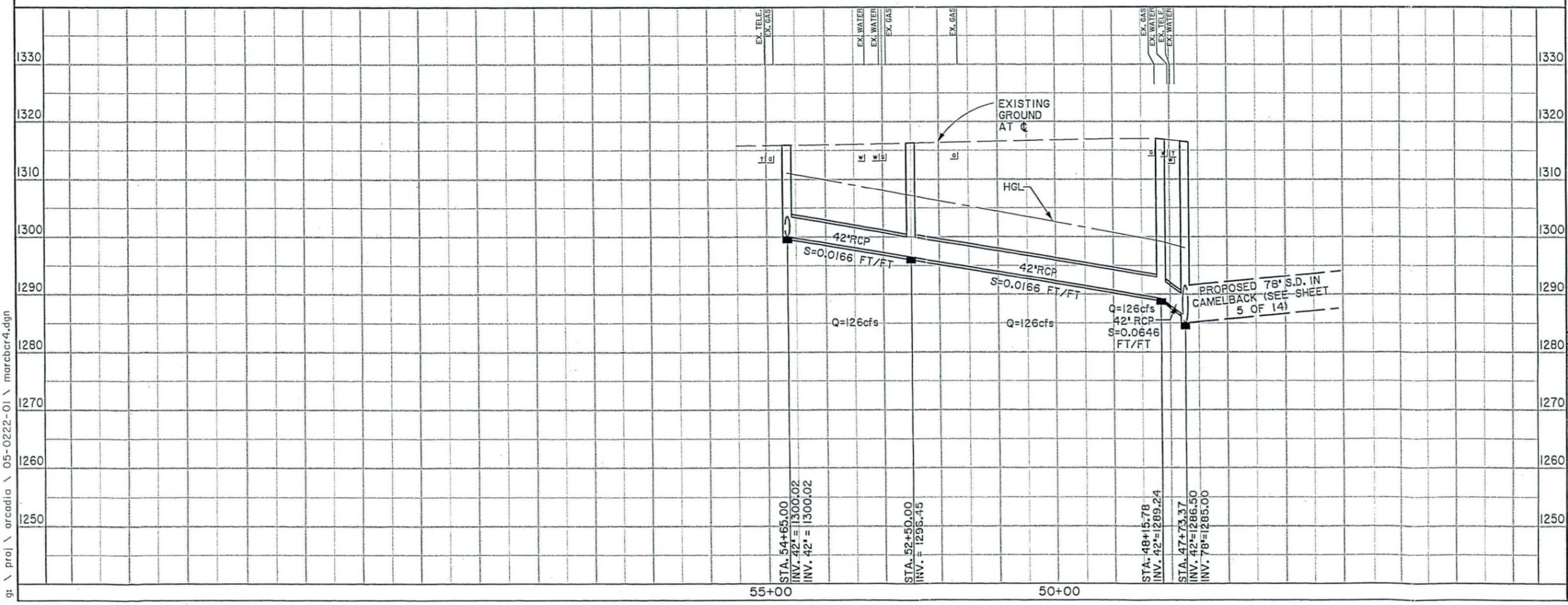
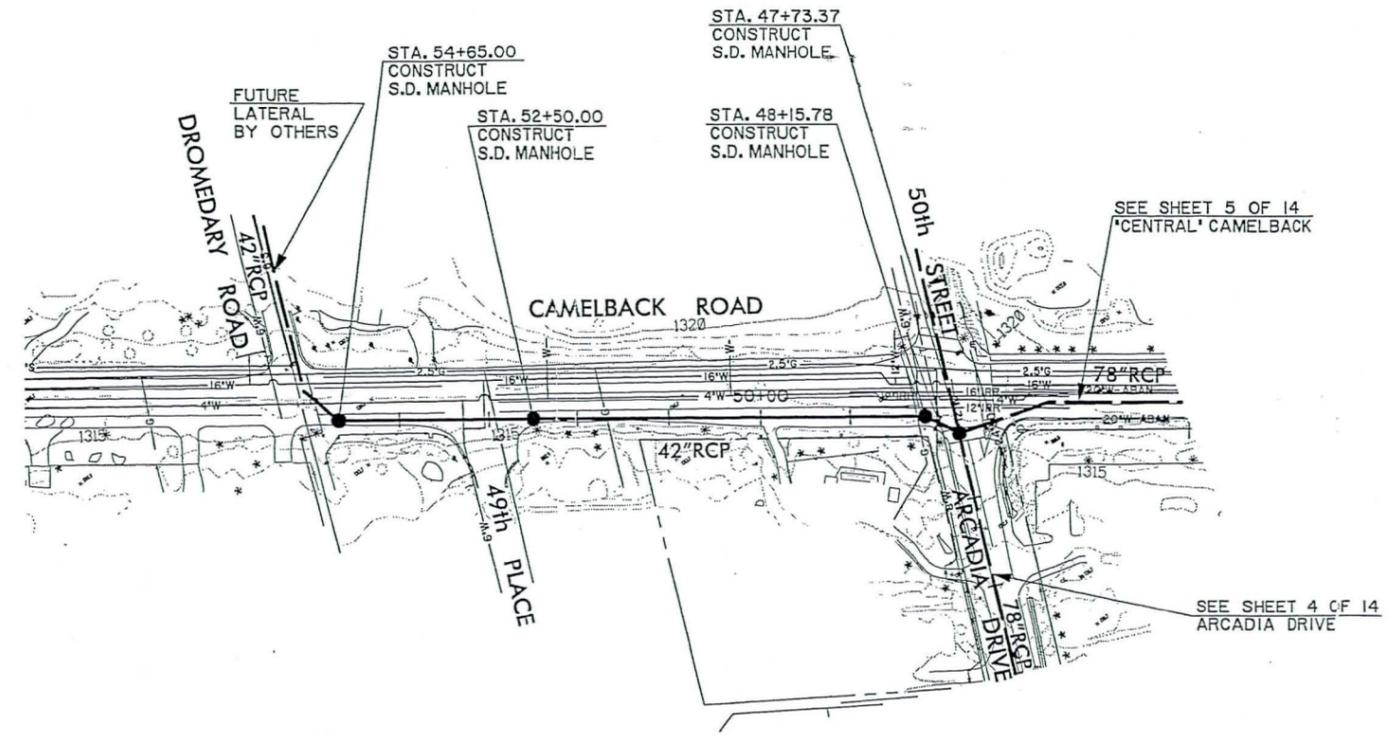
SCALE : 1" = 100' HORIZ.
1" = 10' VERT.

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NO.	REVISION	BY DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION		
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21		
	DESIGNED	J. GIRAND 03-97
	DRAWN	B. McK. 03-97
	CHECKED	R. WISE 03-97
	HUITT - ZOLLARS <small>6245 N. 24th PARKWAY SUITE 102 PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8053</small>	

ALTERNATE 2 SHEET
"CENTRAL" CAMELBACK 7 OF 14

NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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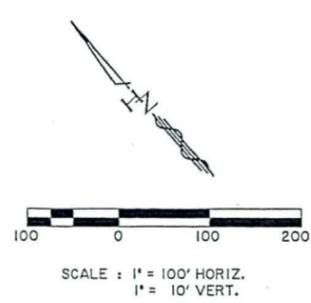
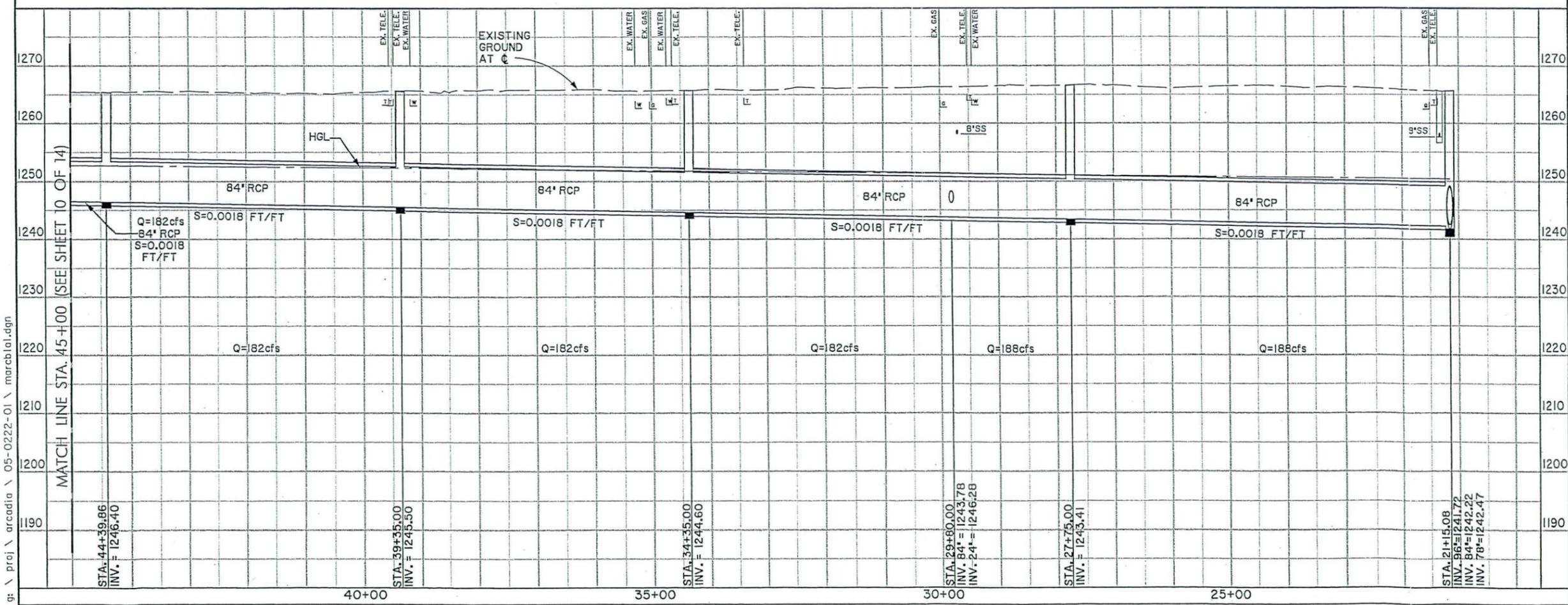
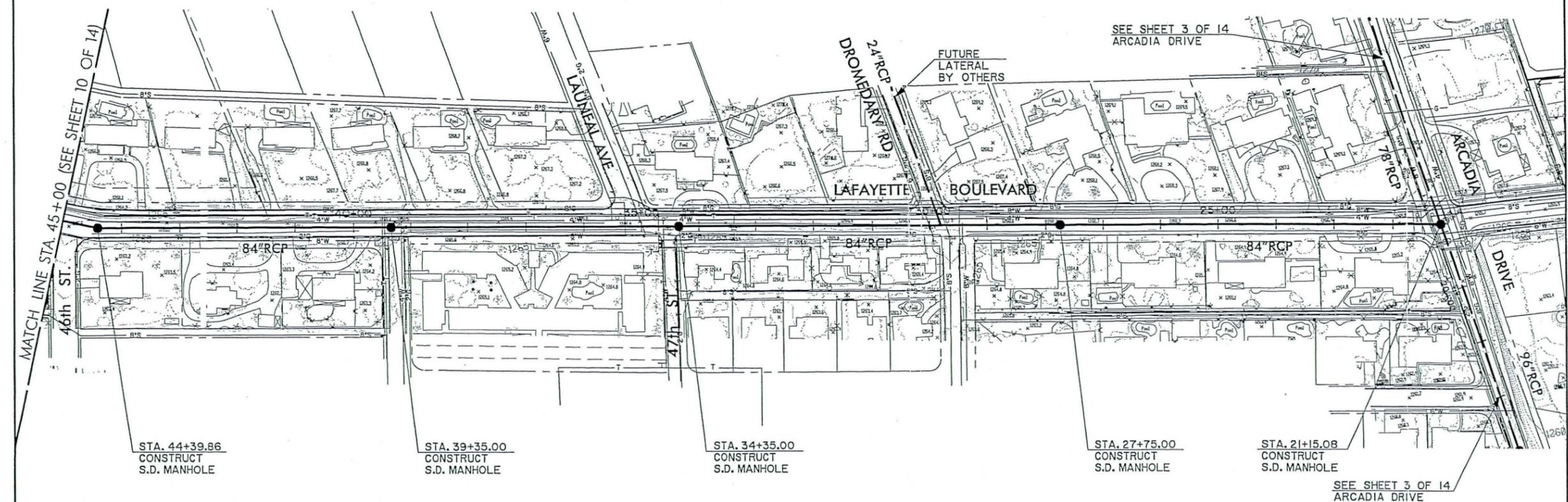
3			
2			
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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
	DESIGNED	J. GIRAND	03-97
	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
HUITT - ZOLLARS <small>6245 N. 24th AVENUE SUITE 102 PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8053</small>			SHEET 8 OF 14

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55+00 50+00

NOTE: UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

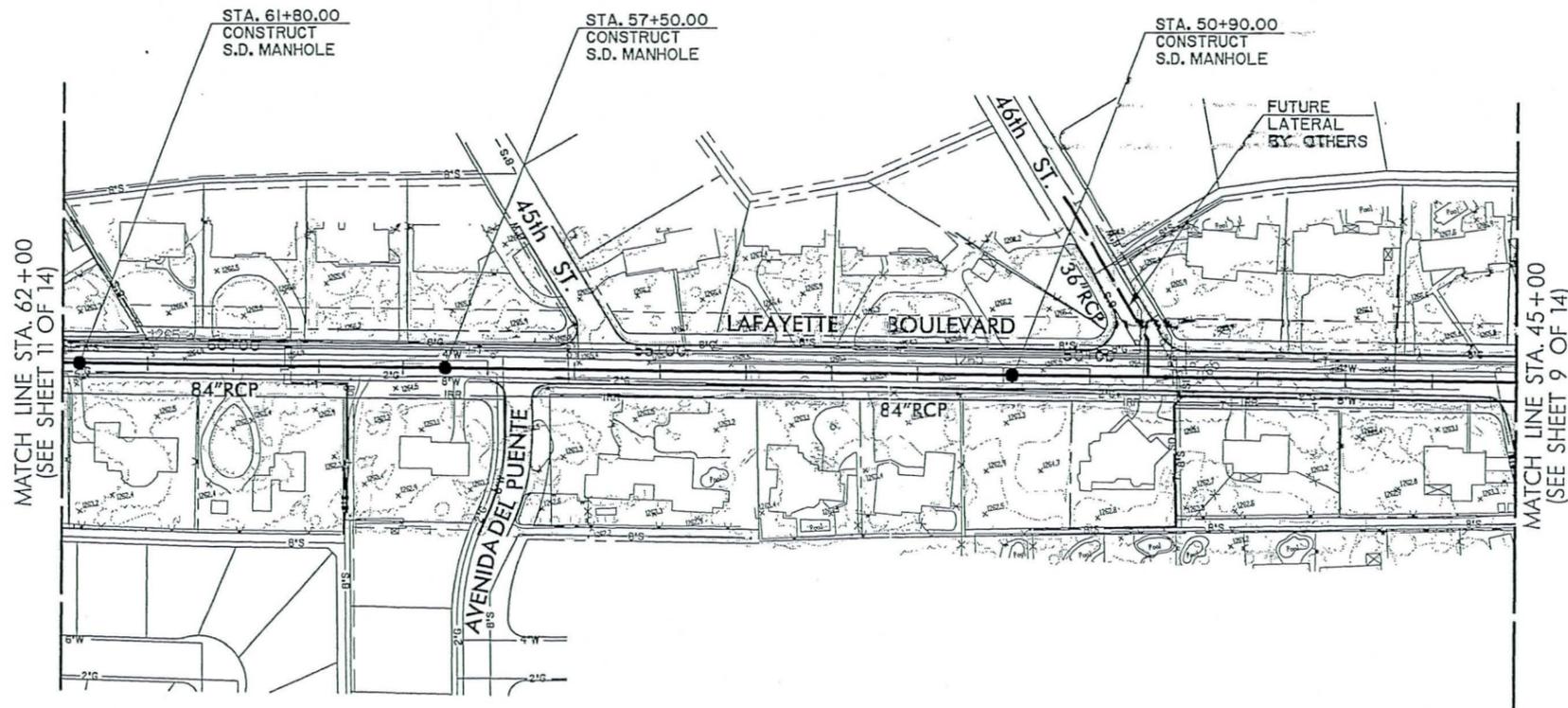
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21

	BY	DATE
DESIGNED	J. GIRAND	03-97
DRAWN	B. McK.	03-97
CHECKED	R. WISE	03-97

HUIITT - ZOLLARS
6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029
(602) 381-0125 FAX (602) 381-8053

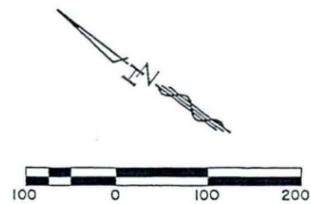
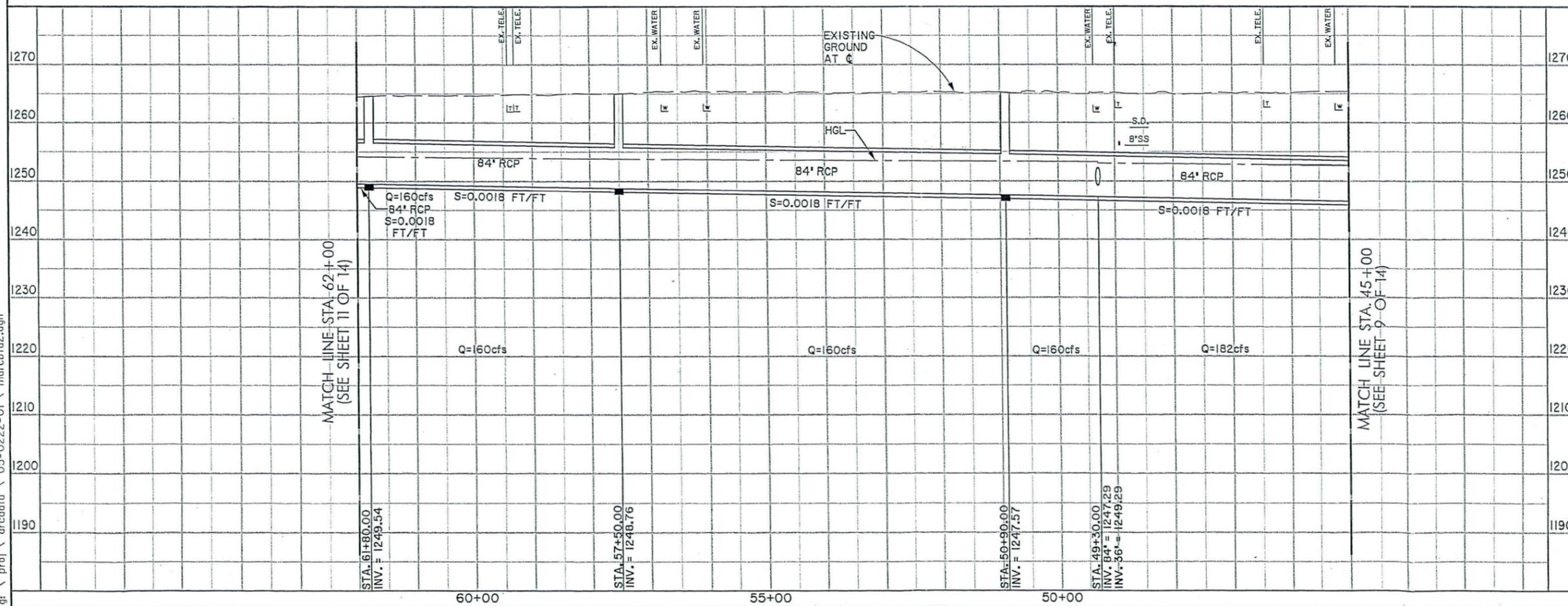
ALTERNATE 2 "WEST" LAFAYETTE - 44th ST. SHEET 9 OF 14

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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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SCALE : 1" = 100' HORIZ.
1" = 10' VERT.

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FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

ARCADIA AREA
DRAINAGE STUDY
PROJECT NO. 94-21

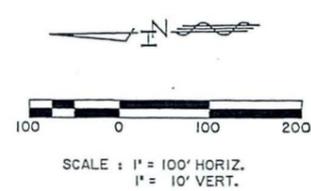
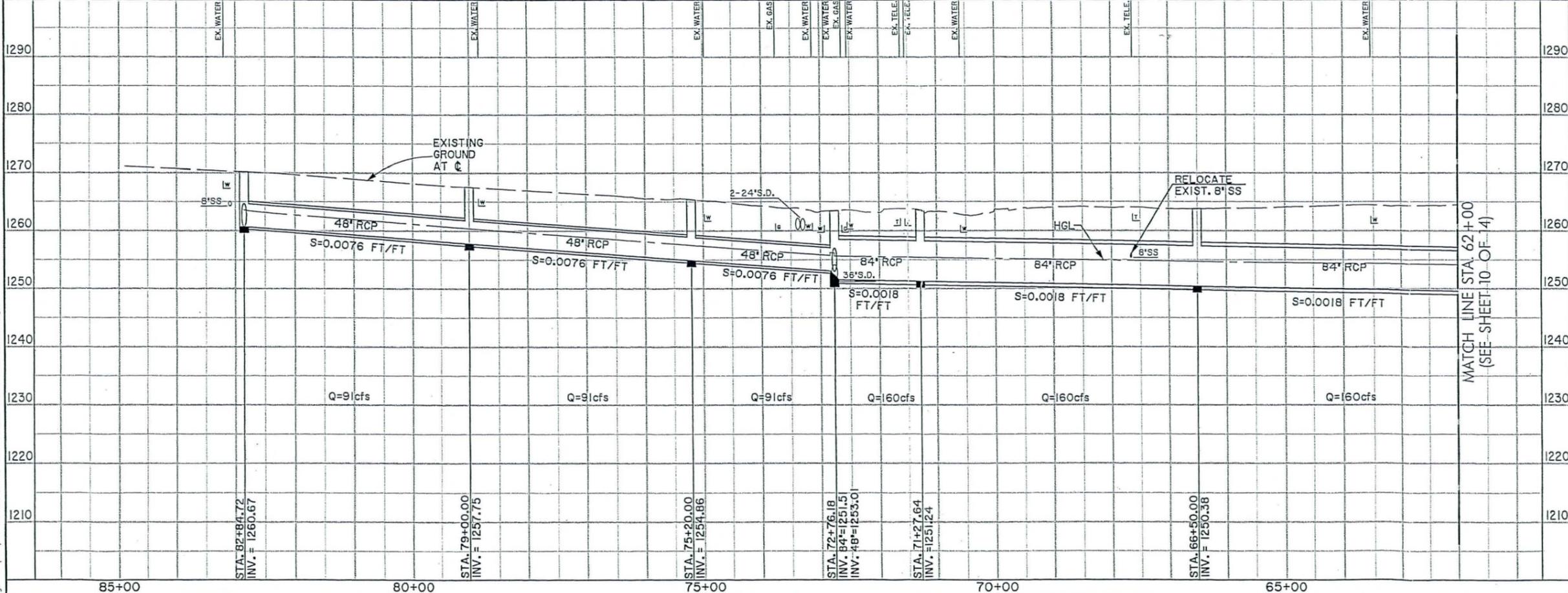
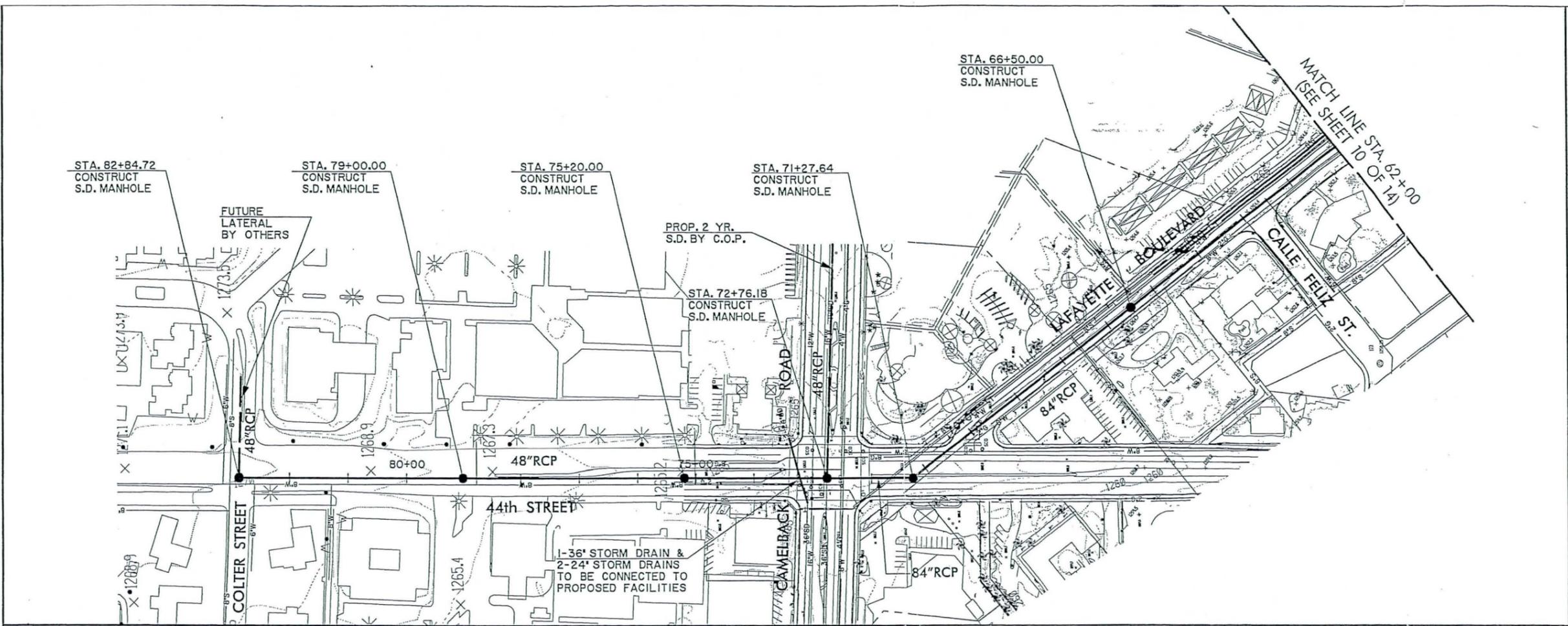
	BY	DATE
DESIGNED	J. GIRAND	03-97
DRAWN	B. McK.	03-97
CHECKED	R. WISE	03-97

HUITT - ZOLLARS
6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029
(602) 381-0125 FAX (602) 381-8033

ALTERNATE 2 SHEET 10 OF 14
"WEST" LAFAYETTE - 44th ST.

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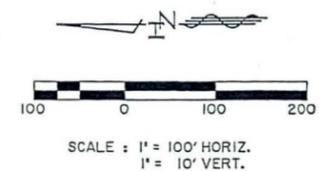
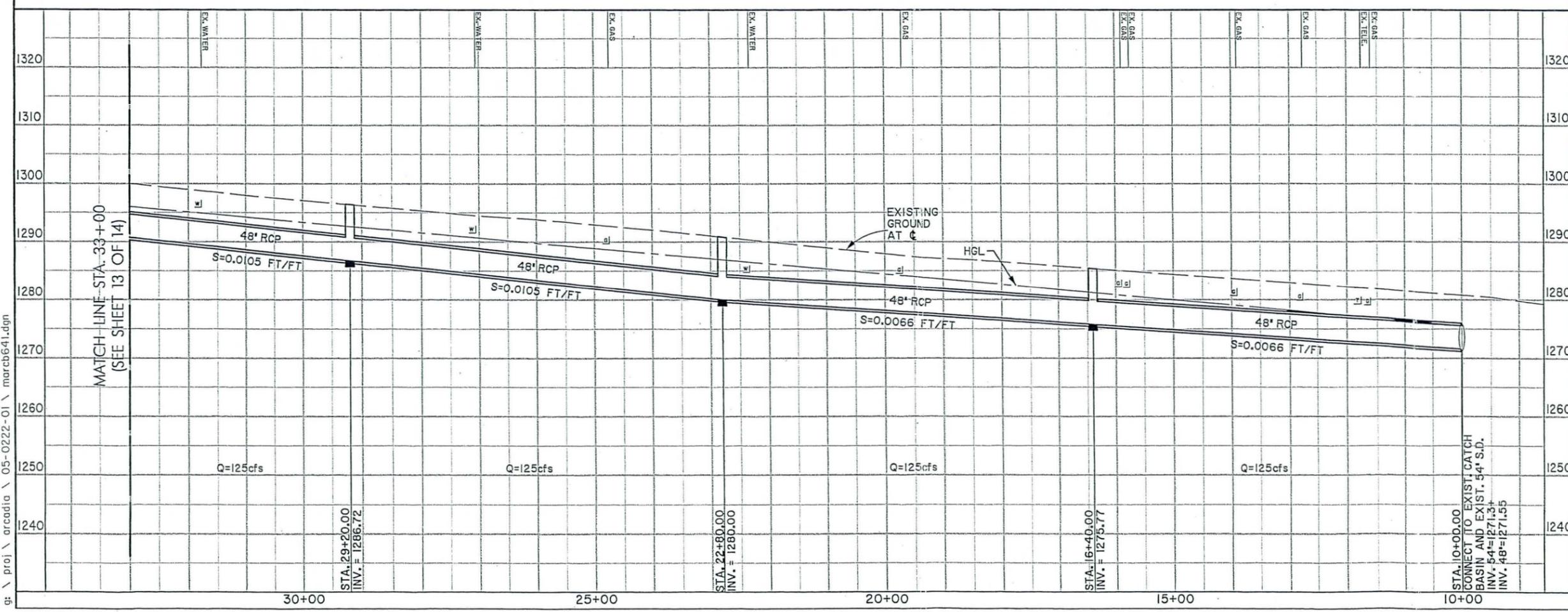
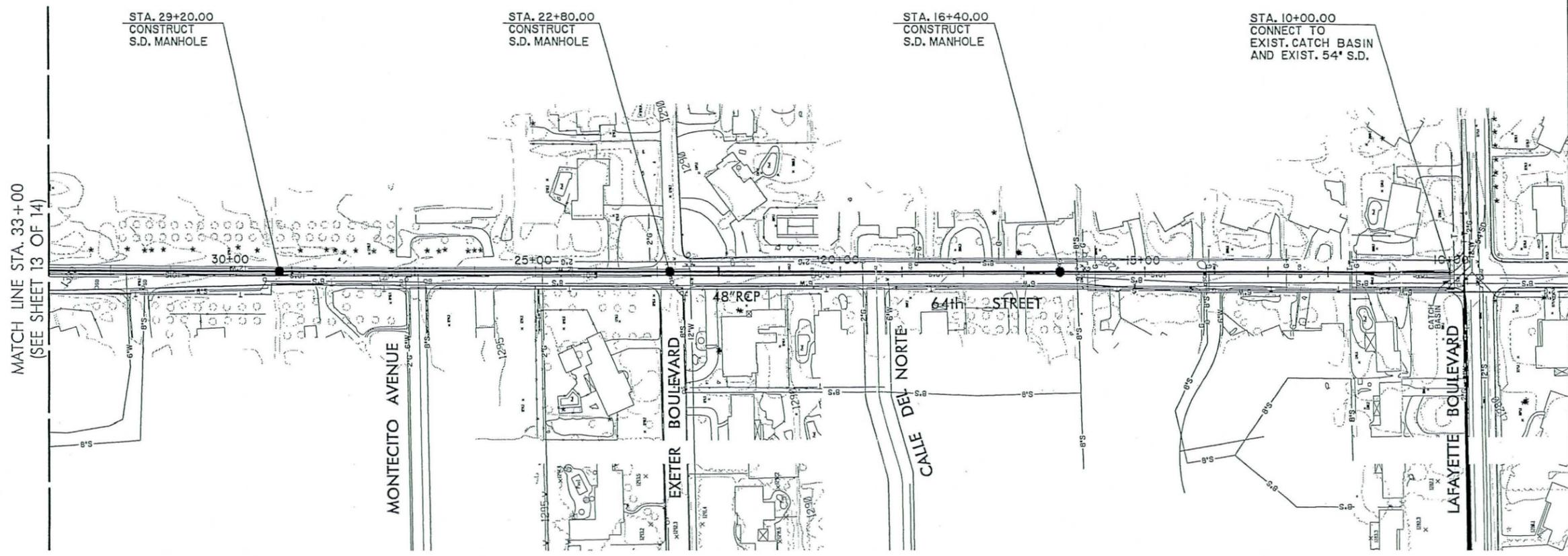
NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.
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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
	DESIGNED	J. GIRAND	03-97
	DRAWN	B. McK.	03-97
	CHECKED	R. WISE	03-97
HUITT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8053</small>			
ALTERNATE 2			SHEET
"WEST" - LAFAYETTE - 44th ST.			11 OF 14

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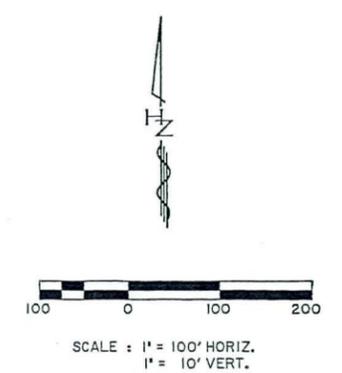
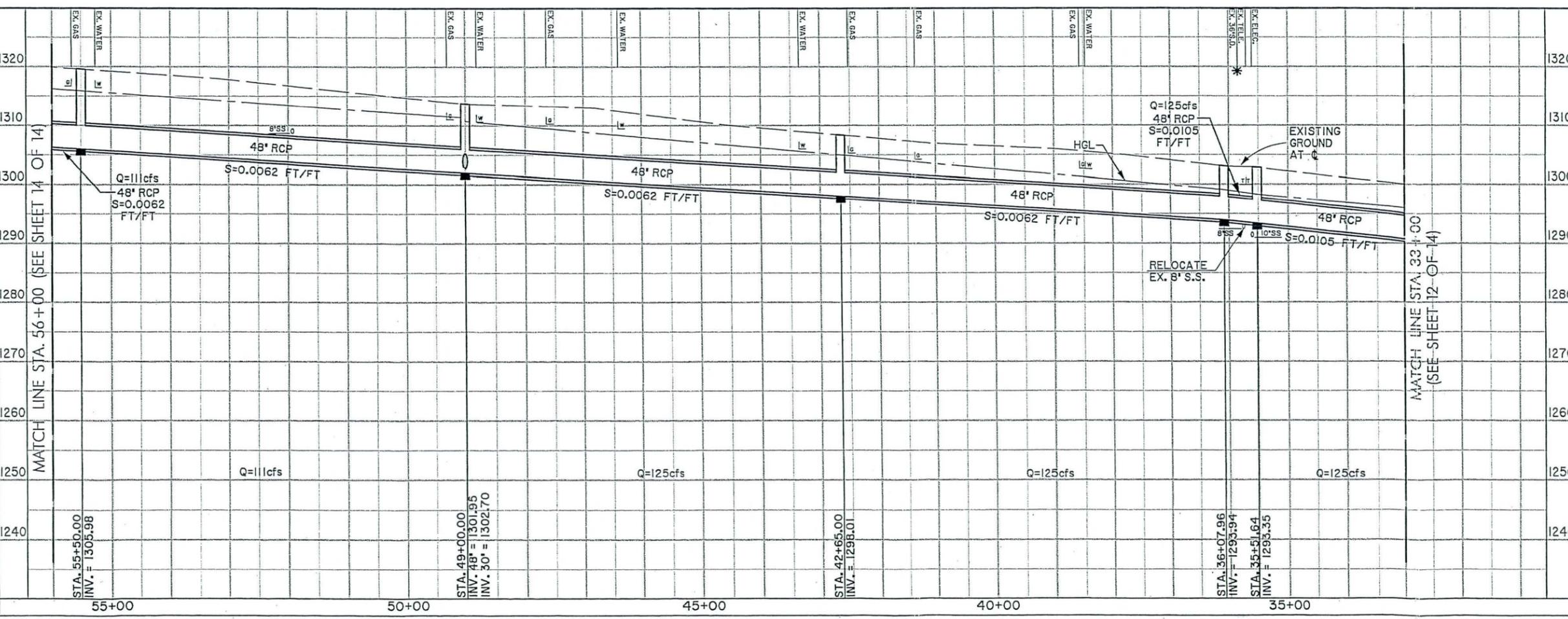
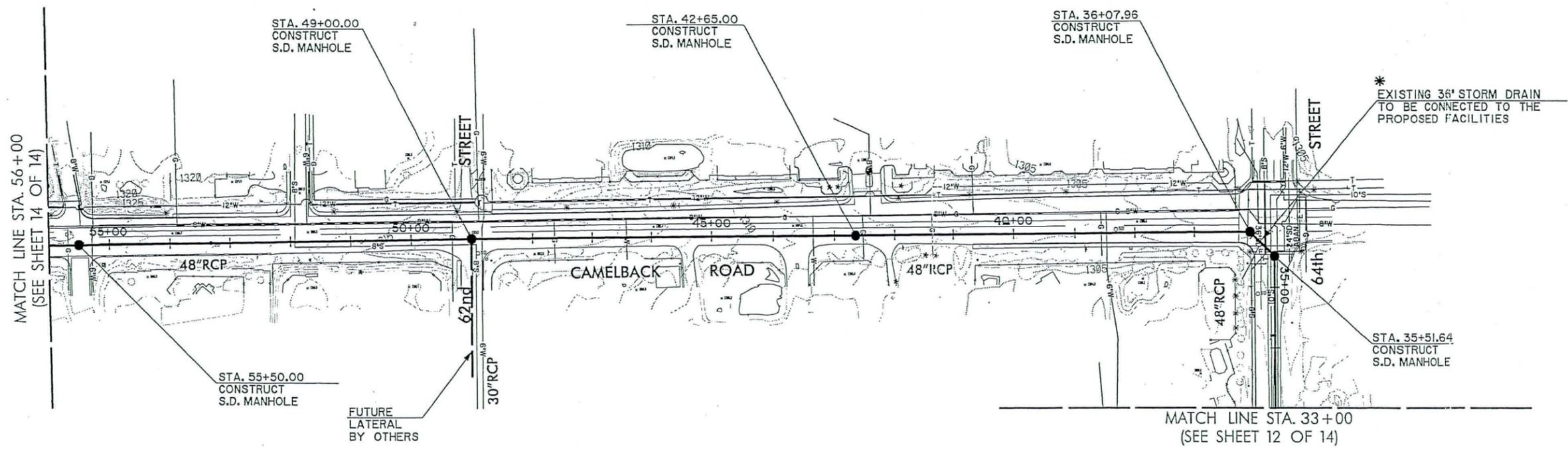
NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.
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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION			
ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
		DESIGNED	J. GIRAND 03-97
		DRAWN	B. McK. 03-97
		CHECKED	R. WISE 03-97
		HUIT - ZOLLARS <small>6245 N. 24th PARKWAY / SUITE 102 / PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-9053</small>	
ALTERNATE 2			SHEET
64th STREET - "EAST" CAMELBACK			12 OF 14

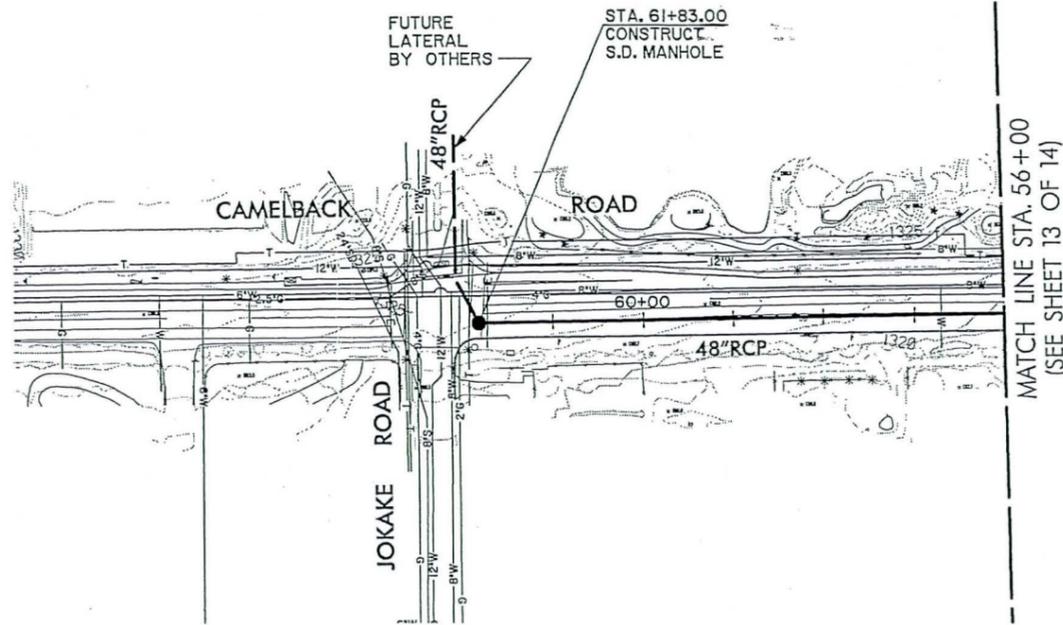
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NOTE: UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.



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NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION ARCADIA AREA DRAINAGE STUDY PROJECT NO. 94-21			
		BY	DATE
		DESIGNED J. GIRARD	03-97
		DRAWN B. McK.	03-97
		CHECKED R. WISE	03-97
		HUITT-ZOLIARS <small>6245 N. 24th PARKWAY, SUITE 102 PHOENIX, ARIZONA 85016-2029 (602) 381-0125 FAX (602) 381-8053</small>	
ALTERNATE 2			SHEET
64th STREET - "EAST" CAMELBACK			13 OF 14

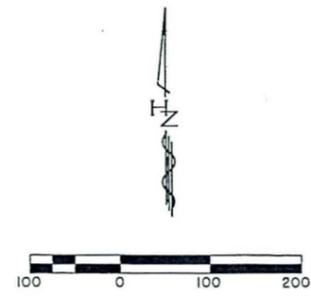
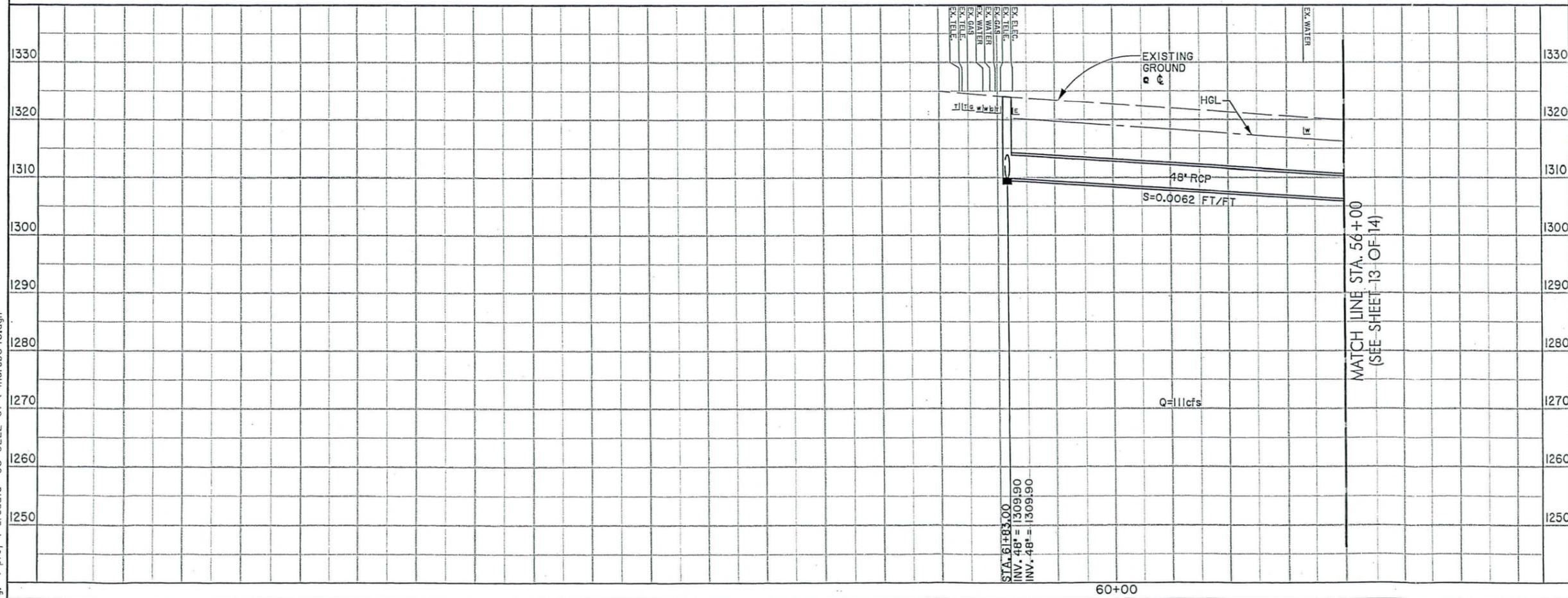
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NOTE : UTILITIES SHOWN IN PROFILE AREA WITH AN ASTERISK WERE NOT ABLE TO BE LOCATED VERTICALLY.

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SCALE : 1" = 100' HORIZ.
1" = 10' VERT.

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION
ARCADIA AREA
DRAINAGE STUDY
PROJECT NO. 94-21

	BY	DATE
DESIGNED	J. GIRAND	03-97
DRAWN	B. McK.	03-97
CHECKED	R. WISE	03-97



HUITT - ZOLLARS
6245 N. 24th PARKWAY, SUITE 102, PHOENIX, ARIZONA 85016-2029
(602) 381-0125 FAX (602) 381-8053

APPENDIX Y
VAN BUREN STREET STORM DRAIN
I-10 to 40th Street

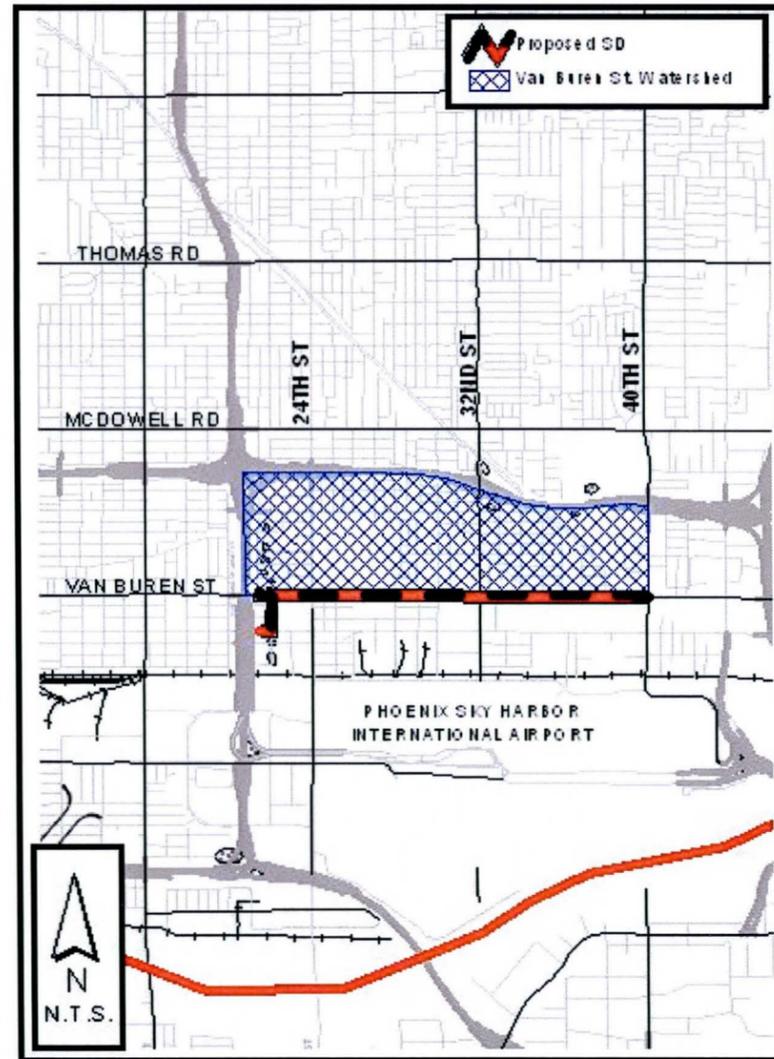
Van Buren Street Storm Drain, 40th Street to I-10 - 10-year Storm Drain

This recommended plan cuts off the north-south flows in the existing 2-year storm drains and diverts that flow plus the local 10-year discharge, in a new storm drain, west along Van Buren Street and discharges to ADOT’s East Tunnel. The watershed is from 40th Street to I-10 and from Loop 202 to Van Buren Street. This plan empties the existing storm drains in 24th Street, 32nd Street and 40th Street so that their capacity can be utilized to collect storm water runoff within Sky Harbor Airport.

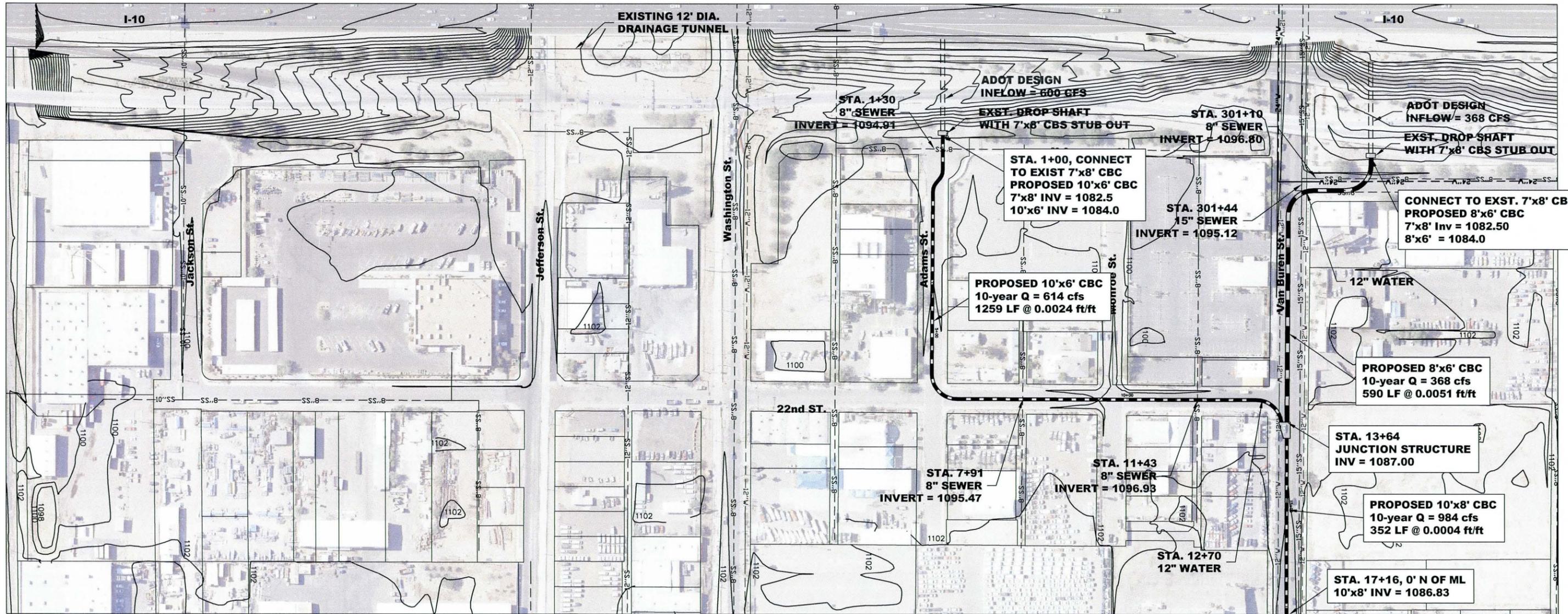
The three existing storm drains that are truncated at Van Buren Street provide a significant benefit for the Airport. The City’s Aviation Department is currently investigating alternatives to improve drainage on the Airport property and they have expressed a desire to utilize these existing storm drains. Truncating the existing storm drains at Van Buren Street leaves them with considerable excess capacity through the Airport. The storm drain also provides 10-year protection for the surrounding commercial and residential areas.

Design Elements/Constraints

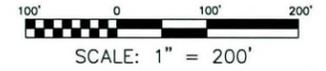
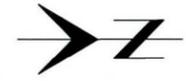
- Requires an agreement with ADOT to discharge to their East Tunnel.
- The new storm drain in Van Buren Street splits the flow at 22nd Street and diverts flow to two discharge locations. The two outfalls are located on the east side of I-10 at Van Buren Street and Adams Street. Both storm drains discharge to existing ADOT stubouts and dropshafts adjacent to I-10.
- The storm drain discharge into the East Tunnel via the existing stubouts is 982 cfs.
- The peak discharge rate from ADOT design inflow rates is 968 cfs (368 cfs at Van Buren Street and 600 cfs at Adams Street).
- Water and sewer utility crossings have been identified in the plan sheets. During the design phase, all the utilities will need to be further investigated.
- The alignment lies within areas of known archeological, NRHP, and HMAc sites, and historic districts that may require mitigation during design and construction (See Final Recommended Alternatives Analysis Environmental Considerations Report by Logan-Simpson Design – April 2007).



Van Buren Street Storm Drain					
Item No.	Item Description	Unit	Unit Price	Quantity	Amount
1	Van Buren connection to East Tunnel, 8'x6' CBC	LF	\$1,397.31	750	\$ 1,047,984
3	Adams St. connection to East Tunnel, 8'x6' CBC	LF	\$1,397.31	400	\$ 558,925
4	Van Buren, 22nd St to 24th St, 10'x8' CBC	LF	\$1,768.43	1200	\$ 2,122,116
5	Van Buren, 28th St to 24th St, 10'x6' CBC	LF	\$1,610.89	2640	\$ 4,252,745
6	Van Buren, 32nd St to 28th St, 90" Pipe	LF	\$1,056.60	2640	\$ 2,789,418
7	Van Buren, 40th St to 32nd St, 72" Pipe	LF	\$869.15	5280	\$ 4,589,117
8	Utility Relocation (Includes removal of Existing 30" SD)	LM	\$250,000.00	3.0	\$ 750,000
Sub Total					\$ 16,110,305
Contingencies (20%)					\$ 3,222,061
TOTAL					\$ 19,332,400



MATCHLINE 17+16 SEE SHEET 2



AIRPORT NORTH

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

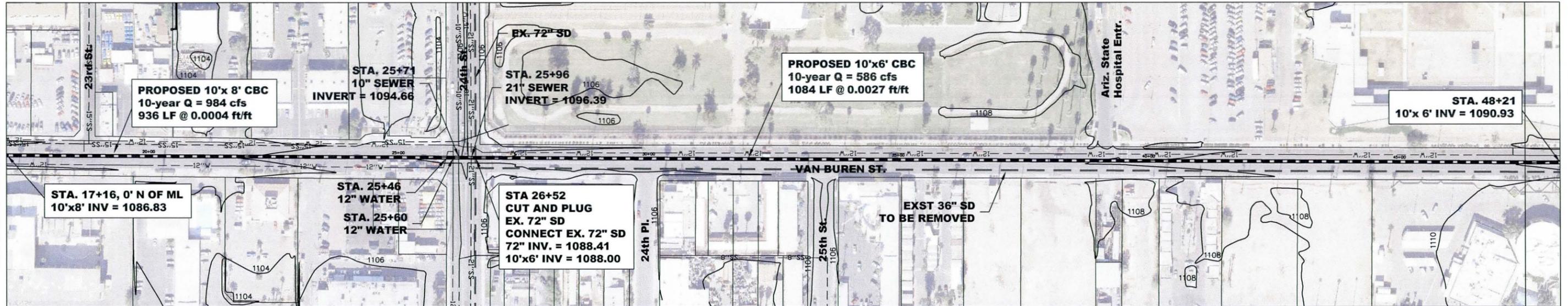
	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

VAN BUREN ST. STORM DRAIN
I-10 to 24th St.

eec	PLAN SHEET	SHEET OF
	JACKSON ST TO VAN BUREN ST	01 03

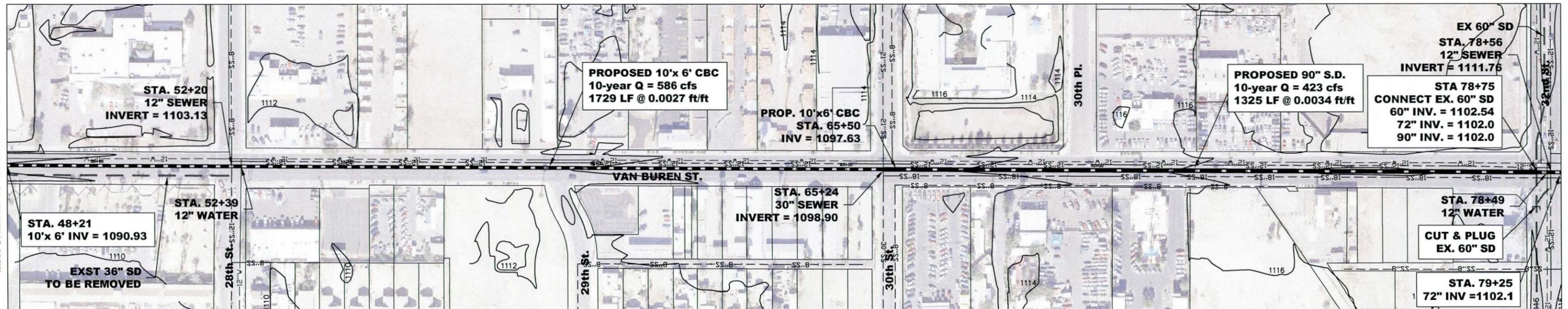
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 AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 17+16 SEE SHEET 1



MATCHLINE 48+21 SEE BELOW

MATCHLINE 48+21 SEE ABOVE



MATCHLINE 79+25 SEE SHEET 3



SCALE: 1" = 200'

AIRPORT NORTH

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

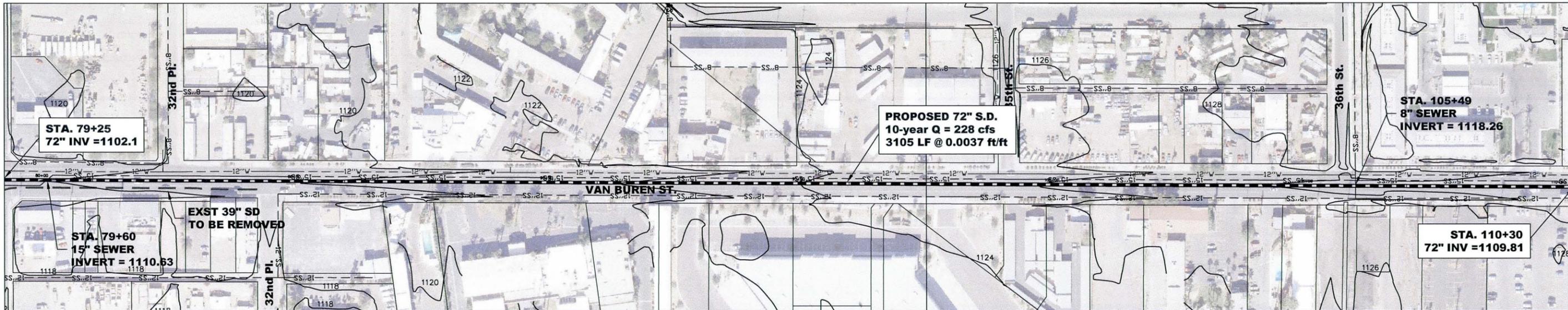
CONCEPT PLANS NOT FOR CONSTRUCTION	BY		DATE
	DESIGNED	CTG	
DRAWN	KLH, SB		09/08
CHECKED	LAV		09/08

VAN BUREN ST STORM DRAIN
Bethany Home Rd. to Orangewood Ave.

eec	PLAN SHEET 23rd St. to 32nd St.	SHEET OF 02 03
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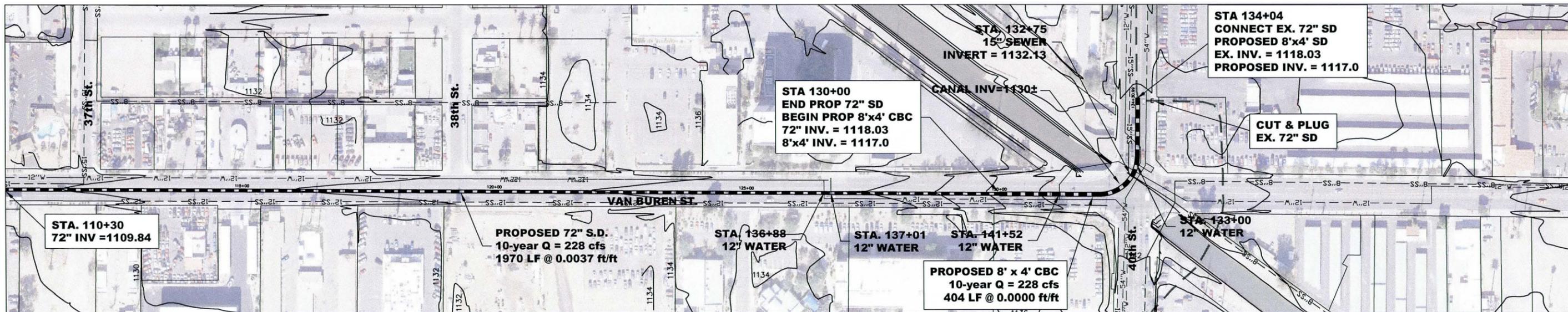
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AERIAL MAPPING SOURCE: 1998 CONTOUR MAPPING - 2' INTERVAL (NGVD '29) PREPARED BY AERIAL MAPPING COMPANY INC. UNDER CONTRACT # FCD 97-14 (PROVIDED BY FCDMC)

MATCHLINE 79+25 SEE SHEET 2



MATCHLINE 110+30 SEE BELOW

MATCHLINE 110+30 SEE ABOVE



AIRPORT NORTH

**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**

METRO PHOENIX ADMP
PROJECT CONTROL NO. FCD2004C040

	BY	DATE
DESIGNED	CTG	09/08
DRAWN	KLH, SB	09/08
CHECKED	LAV	09/08

VAN BUREN ST. STORM DRAIN
Bethany Home Rd. to Orangewood Ave.



PLAN SHEET
32nd St. to 40th St. SHEET OF
03 03