Sports Complex Feasibility Study

city of Goodyear

May 2024

city of Goodyear

J2 Engineering and Environmental Design, LLC

DRAFT









Part One

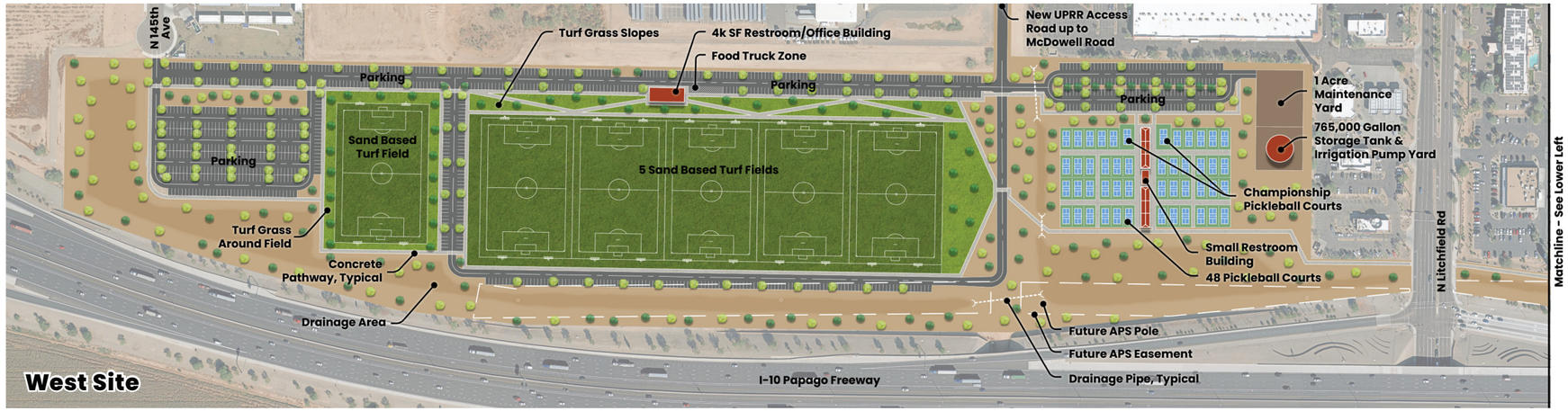
Executive Summary

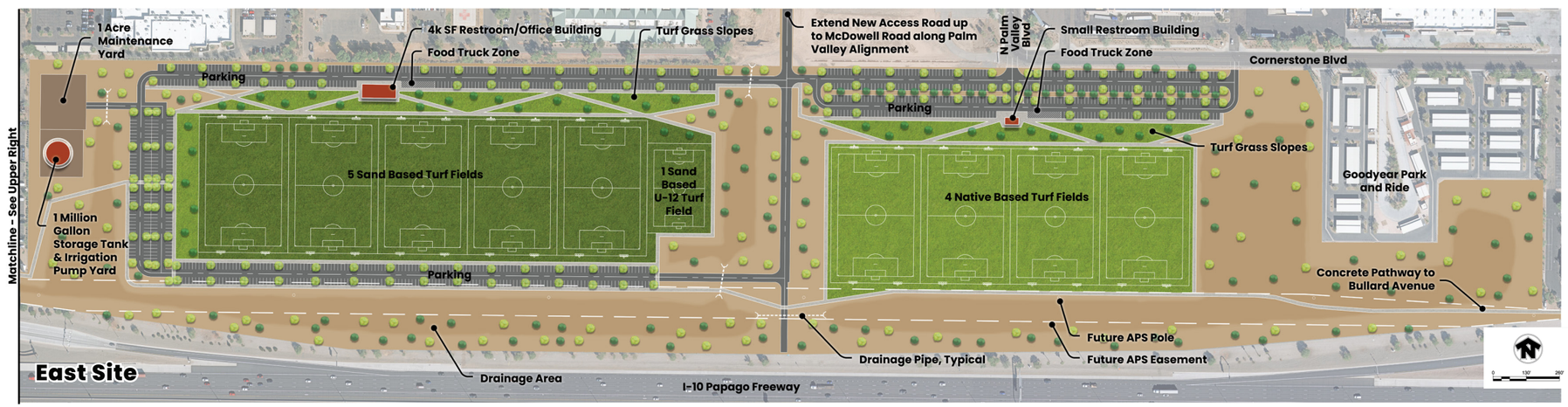
1.0 EXECUTIVE SUMMARY

The city of Goodyear has conducted a feasibility study to explore the opportunities and challenges of designing and constructing a sports complex within the regional detention basins on the north side of I-10, between Dysart Road and Bullard Road. This sports complex would offer access to high quality soccer fields and pickle ball courts. The intent of this study and report was to conduct a comprehensive site analysis of the proposed location, including exploring programing opportunities, as well as physical site constraints and mitigation measures to produce a preferred conceptual design alternative showcasing the feasibility of the Goodyear Sports Complex project.

Statement of Need

Soccer and pickle ball are two of the fastest growing recreation activities in Arizona. Adult and youth soccer have seen massive growth in Arizona over the last 20 years. While the Phoenix Metro area has over 20 soccer complexes with four fields or more, access to soccer fields and complexes in the southwest valley is limited . Additionally, pickle ball has grown rapidly in popularity in recent years and the city of Goodyear is seeing an increased demand for large, tournament-style pickle ball complexes. The proposed Goodyear Sports Complex would improve access to soccer fields and pickle ball courts for city residents and offers a great opportunity to create a positive economic impact for the city and the surrounding community.





Site Description

The site consists of four large regional detention basins located along the I-10 freeway on both the east and west sides of Litchfield Road. This land is already owned by the city and offers the amount of space required for a large sports complex. The basins, created as borrow pits for the I-10 freeway construction, are oversized for their storm water storage requirements. The basins have capacity to support the development recreational amenities within them without impacting the storm water management purposes they serve.

The total site area is approximately 129 acres with 72 acres located east of Litchfield Road and 57 acres located west of Litchfield Road, excluding the UPRR property. Both the east and west basins are bordered by I-10 to the south and a major commercial area and medical campus to the north. The west basin is bisected by a Union Pacific Railroad (UPRR) remnant parcel (2.41 acres)that runs from McDowell Road to an I-10 underpass. A future Arizona Public Service (APS) Three Rivers transmission line will run parallel to the I-10 across the southern portion of the entire site and will contain 130’ high power line poles within a 90’ wide easement.

1.0 EXECUTIVE SUMMARY

Site Opportunities:

This particular site has a lot of advantages for a large sports complex that include:

- Land- Championship soccer fields require almost 2 acres per field. With almost 138 acres available for development, a large sports complex can be created that will accommodate multiple user groups and activities at the same time.
- Regional Access - With the site being adjacent to the I-10 freeway and with three freeway exits at Dysart Road, Litchfield Road, and Bullard Road; the sports complex can attract users from all over the valley and state. The site is also well positioned to attract traveling soccer clubs from California.
- Land Use - A regional sports complex is a good land use adjacent to a major interstate highway. Additionally, the adjacent commercial developments could see increased activity from visitors to the sports complex, both local and regional visitors.
- Utilities - Due to the development around the site, the sports complex has reasonable access to water, sewer, reclaimed water, and electricity.

Site Constraints:

Developing a larger regional sports complex in this location has some challenges that must be overcome that include:

- Grading & Drainage - The proposed site is a regional storm water detention basin that flows from the west to the east and this function must be maintained. The proposed site plan ensures that key site amenities are elevated to keep them high and dry during smaller storm events. While key amenities will remain protected, some amenities will need to be designed to flood with larger storms. Elevating amenities above storm water flooding for protection will require importing large amounts soil and grading the site to ensure ADA requirements are met.
- Land Acquisition- There are two parcels of land that need to be acquired or dedicated as right-of-way:
    - The UPRR parcel on the west site will need to be purchased or an access agreement reached with the UPRR. This will unify the site, allow vehicular access to McDowell Road, and to gain access to the existing utilities (water, sewer and reclaimed) along McDowell Road and route them to the site.
    - Dedicating new right-of-way along the Palm Valley alignment on the east site will provide better vehicular access to McDowell Road and to the existing utilities (water, sewer & reclaimed) along McDowell Road.
- Site access - It is important to offer several ingress and egress points at large sports complexes to allow for visitors to reasonably get in and get out. As the site is surrounded by existing developments, good access to the site could be difficult. Obtaining the UPRR parcel and the Palm Valley alignment right-of-way will be critical to minimize bottle necks before and after games.
- Water - Providing irrigation water to approximately 12 soccer fields in the middle of summer will be critical for developing high quality soccer fields. Fortunately, the site is close to a Liberty Utilities 12" reclaimed water line in McDowell Road. Gaining access to the reclaimed water by negotiating water allotments with Liberty will need to occur before sports field development can occur.
- APS easement - The future APS easement with 130' power poles will impact the development of the sports complex. The easement will have restrictions on what site elements can or cannot be developed within the easement. It will be critical ensure that the site design plans for this and only includes approved amenities within the easement.
- Environmental - An underground plume of contaminated ground water runs through the middle of the site. Existing ground water extraction wells, treatment facilities, and clean water injection wells are located on site and will need to be protected in place during the development of the site.

1.0 EXECUTIVE SUMMARY

Risks:

The project area is, and must remain in the future, a regional storm water retention facility. Any development within the site must accommodate the stormwater detention function of the interconnected basin system. However, the existing site is oversized for the amount of storm water required to be detained, which creates opportunities for development that can utilize portions of the site while preserving its drainage function.

The Goodyear Sports Complex has been designed to manage storm water events in a way that balances the development costs of elevating amenities above various flood inundation levels with the costs of maintaining and cleaning recreation amenities after a flood event. Drainage pathways will be maintained from the various storm water inflow locations around the perimeter of the basin facility to the outlet located near I-10 and Dysart Rd. Additional low-lying desert areas along the south edge of the site will contain nuisance storm water from the smallest and most frequent storm events as it passes through the sports complex facility.

The native-based turf fields in the far east, between the Palm Valley alignment and Dysart Rd, are set at an elevation below the anticipated 10-year ponding level. The amount of soil needed to elevate these fields above the 10-year event was not deemed cost effective.

The elevation of sand-based fields and some parking lot areas throughout the rest of the sports complex were elevated just above the 10-year ponding level as grass and asphalt can withstand some degree and duration of standing water.

The elevation of the pickleball courts was set above the 50-year ponding level. These courts are post-tensioned slabs and have special acrylic coatings that may be susceptible to long-term standing water. However, it is not required to elevate these courts above a 100-year ponding level for health or safety reasons.

The elevation of permanent structure and major equipment, such as restroom buildings, pumps, electrical equipment, and other elements related to health, safety, and welfare, have been elevated above the 100-year ponding level.

Feature	Level of Protection from Storm Water Inundation
Parking Lots	10-Year
Sand Base Natural Soccer Turf Fields	10-Year
Pickleball Courts	50-Year
Restroom Buildings	100-Year
Maintenance & Irrigation Pump Yard	100-Year

Phasing and Opinion of Probable Cost

The Phasing Plan and Phase Opinions of Probable Cost establish priorities and delineate budget constraints within a pragmatic and coherent framework. By functioning as a comprehensive planning tool, the phasing plan allows the city of Goodyear to systematically develop the sports complex to its full potential.

The first phase comprises essential facilities such as utilities, a road connection to McDowell Road, a maintenance yard, water storage tank, and a pump yard. Additionally, it includes six sand-based championship-sized soccer fields, a restroom and office building, forty-eight pickleball courts with a small restroom, and ample parking.

The second phase includes various amenities such as utilities, a road connecting to McDowell Road, a maintenance yard, a water storage tank and pump yard, five championship-sized soccer fields with sand bases, one U-12 field with a sand base, a restroom and office building, as well as parking.

Phase three comprises utility installations, four regulation-sized soccer fields designed for championship matches, a restroom facility, and a parking area.

Phase	Construction Cost
Phase 1	$64,936,073
Phase 2	$43,401,847
Phase 3	$21,737,877
Total	**$130,075,797**

Closing

The city of Goodyear has an opportunity to develop a major regional sports complex along the I-10 freeway that could have a major economic impact. There is ample land and available utility infrastructure to ensure the development of a quality sports complex, but several challenges must be resolved prior to developing the project and considered during future design and construction phases of this project. The Goodyear Sports Complex Feasibility study addresses these challenges in detail and showcases a preferred alternative conceptual design for the Goodyear Sports Complex. The report details next steps and initial issues that need to be addressed and will guide future phases of this project to ensure that a high-quality sports complex project is achieved.

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INTRODUCTION

The city of Goodyear owns two regional detention basins that are strategically located on the north side of I-10, between Dysart and Bullard Roads. The main goal of this study is to investigate the potential utilization of these basins for both recreational and stormwater management purposes. To achieve this, a comprehensive site analysis was conducted to identify the opportunities and limitations of the site. Concept Alternative designs were developed to determine the city's priorities. With input from the city of Goodyear, the Concept Alternatives were refined down to a Preferred Alternative Concept and a rough order of magnitude opinion of probable cost was developed for the potential enhancements. The program may include the construction of sand based natural turf grass championship soccer fields, a pickleball complex, a maintenance facility, restrooms, shade structures, walking paths, and associated parking facilities.

The feasibility study for this project is divided into four sections:

- Introduction
- Site Analysis
- Preferred Alternative
- Phasing and Opinion of Probable Cost

The primary objective of this study is to provide the city of Goodyear with a detailed site analysis and a high-level conceptual site plan that will serve as a valuable resource to guide the development of a high quality regional sports complex.



Conceptual Rendering - Overview of Pickleball



Conceptual Rendering - Championship Field



Conceptual Rendering - Soccer Fields



Conceptual Rendering - Overview of Fields



Conceptual Rendering - Soccer Fields

Part Two

Site Analysis

2.0 SITE ANALYSIS

2.1 Overview

The Goodyear Sport Complex Feasibility Study explores the possibilities and challenges for the city of Goodyear to develop a large sports complex within four (4) existing drainage basins along the north side of the I-10 Freeway divided by Litchfield Road (*see Figure 1B*). This report evaluates site development constraints including existing utilities, drainage, easement restrictions, and site ingress/egress. Sports complex amenities such as soccer fields, pickleball courts, trails, restrooms, ramadas, parking, and a maintenance facility will be evaluated for use on site.

A review of soccer complexes around the Valley reveal that there are about 25 large and small soccer complexes in Phoenix and the surrounding communities including the City of Maricopa and Casa Grande. A large soccer complex is defined as a facility that has eight (8) or more championship fields and a small soccer complex is defined as having four to seven (4 to 7) championship fields. The southwest valley does not have many soccer complexes and two of the nearby complexes are not popular with valley users because they charge to park and the fields are not in good condition. With proper development and maintenance the Goodyear Sports Complex has an opportunity to be the premier soccer destination in the southwest valley region (*see Figure 2*).

2.2 Site Context

The project site area is approximately 129 acres and consists of four large 10'-15' deep drainage basins with 4:1 side slopes located on the north side of the I-10 Freeway. Two of the basins are located east of Litchfield Road (78 acres) and two of the basins are located west of Litchfield Road (59 acres). The existing basins were originally constructed as borrow pits for the I-10 freeway construction, but also serve as storm water detention basins for the I-10 Freeway and other surrounding developments. The adjacent city owned Park and Ride contains the outfall for the basins.

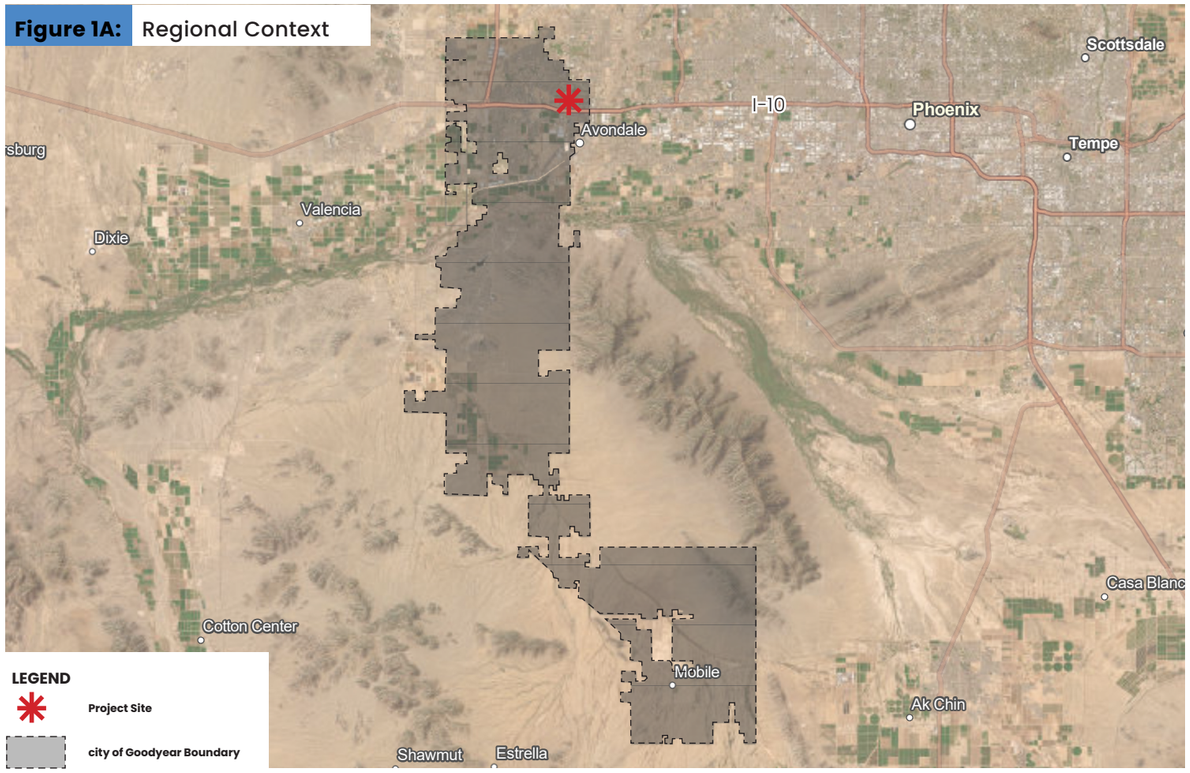
The I-10 Freeway is located to the south of the site and McDowell road is located about ¼ mile north of the basins. 145th Avenue serves as the western edge of the site and Dysart Road is the eastern boundary.

The adjacent land use mostly consists of commercial developments to the north of the site. The eastern basins are surrounded by a Valley Metro park and ride facility, several large commercial developments and a hospital/ medical office complex. The western basins are bordered to the north by a large commercial development, a large industrial building, multi-family residential complexes and undeveloped land (*see Figures 3A & 3B*).

Litchfield Road and several small commercial developments pose as a strong physical and visual barrier between the two sides of the Goodyear Sport Complex, however, a drainage connection between the two sides is located just north of the Litchfield Road I-10 freeway on and off ramps.

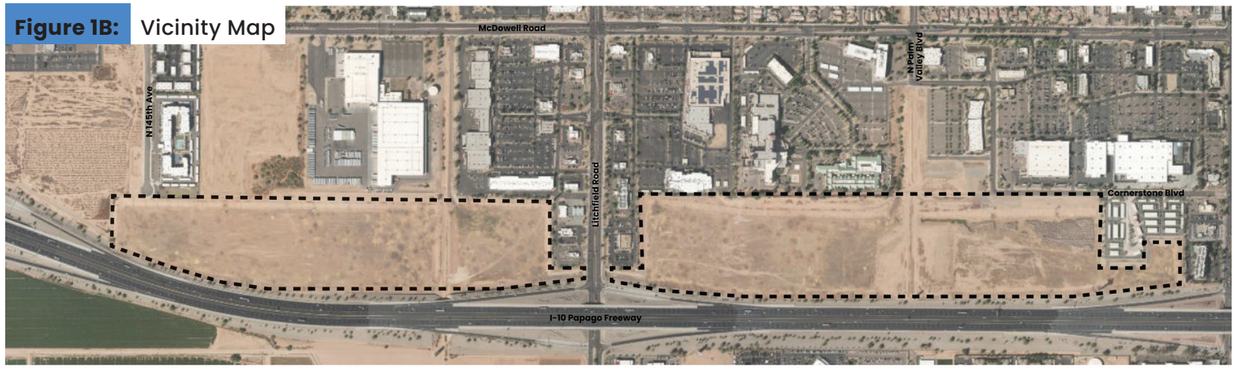
An existing 50' wide Union Pacific railroad (UPRR) property bisects the western basin along an abandoned rail spur on the approximate 140th Avenue alignment and connects to an underpass under the I-10 freeway (*see Figures 4A & 4B*).

Figure 1A: Regional Context



Regional Context - city of Goodyear

Figure 1B: Vicinity Map



Vicinity Map

LEGEND

- Project Site
- 1 Reach 11
- 2 Scottsdale Sports Complex
- 3 Bell 94 Sports Complex
- 4 Rose Mofford
- 5 Lehi Sports Complex
- 6 Eagles Park
- 7 Quail Run Park
- 8 Red Mountain Sports Complex
- 9 Santos Soccer Complex
- 10 Legacy Sports Complex
- 11 Gilbert Youth Soccer Association Sports Complex
- 12 Tumbleweed Park
- 13 Snedigar Park
- 14 Pecos Park
- 15 Tempe Sports Complex
- 16 Benedict Sports Complex
- 17 Desert West Park
- 18 Phoenix Event Center
- 19 Pioneer Park
- 20 Paloma Park
- 21 Friendship Park
- 22 Sundance Park
- 23 Copper Sky Park

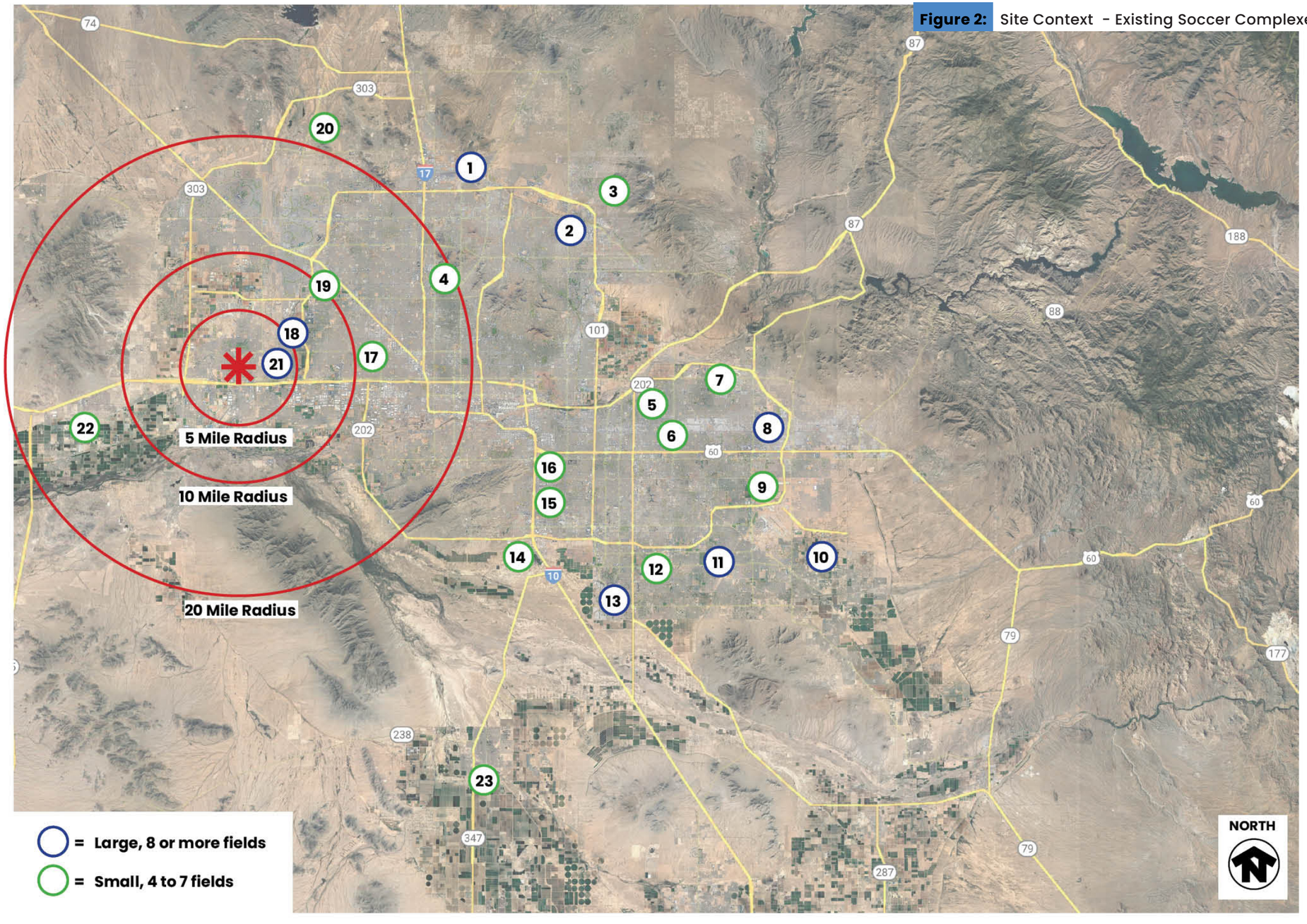
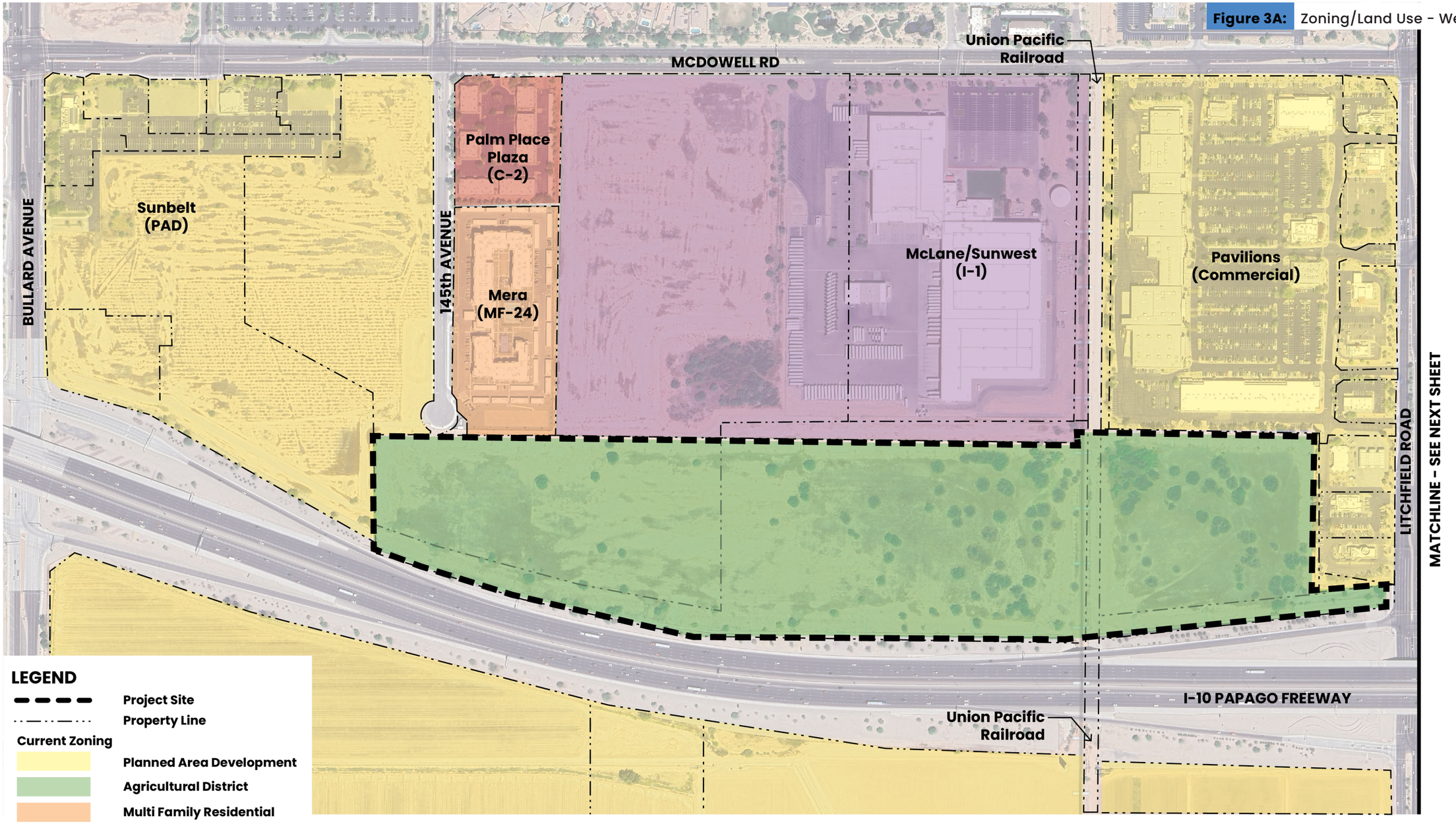


Figure 2: Site Context - Existing Soccer Complexes

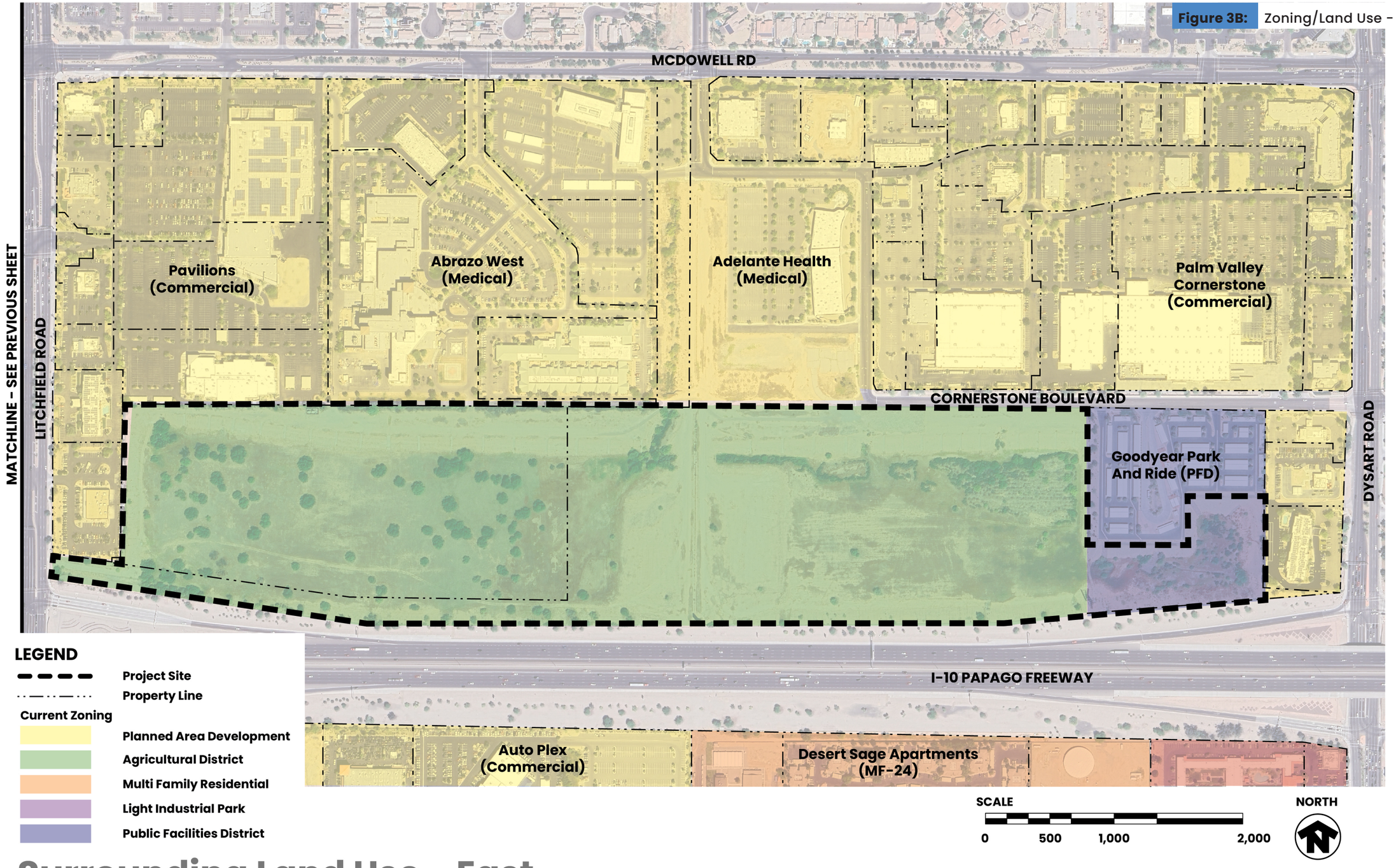
Regional Context - Soccer Facilities

Figure 3A: Zoning/Land Use - West



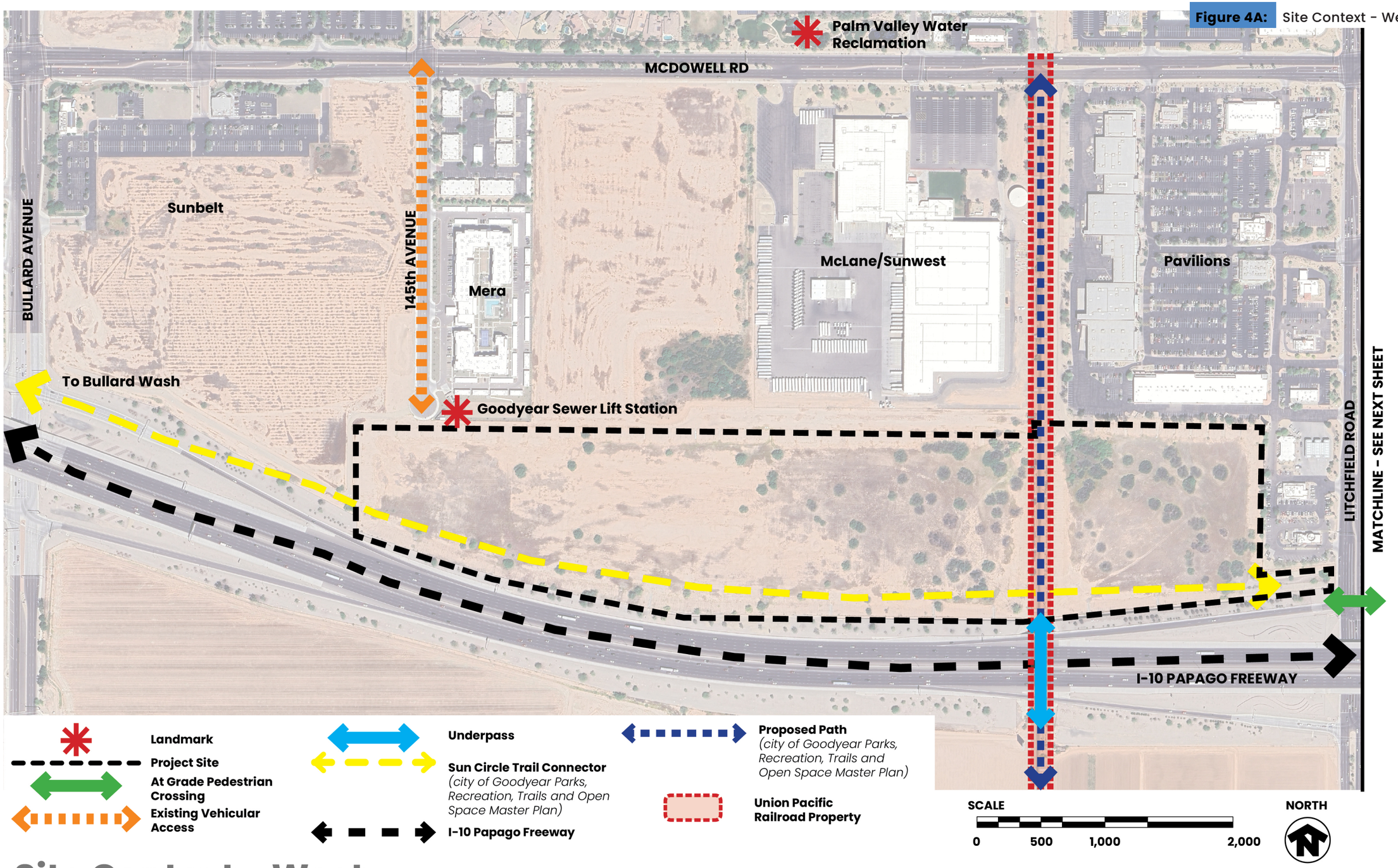
Surrounding Land Use - West

Figure 3B: Zoning/Land Use - East



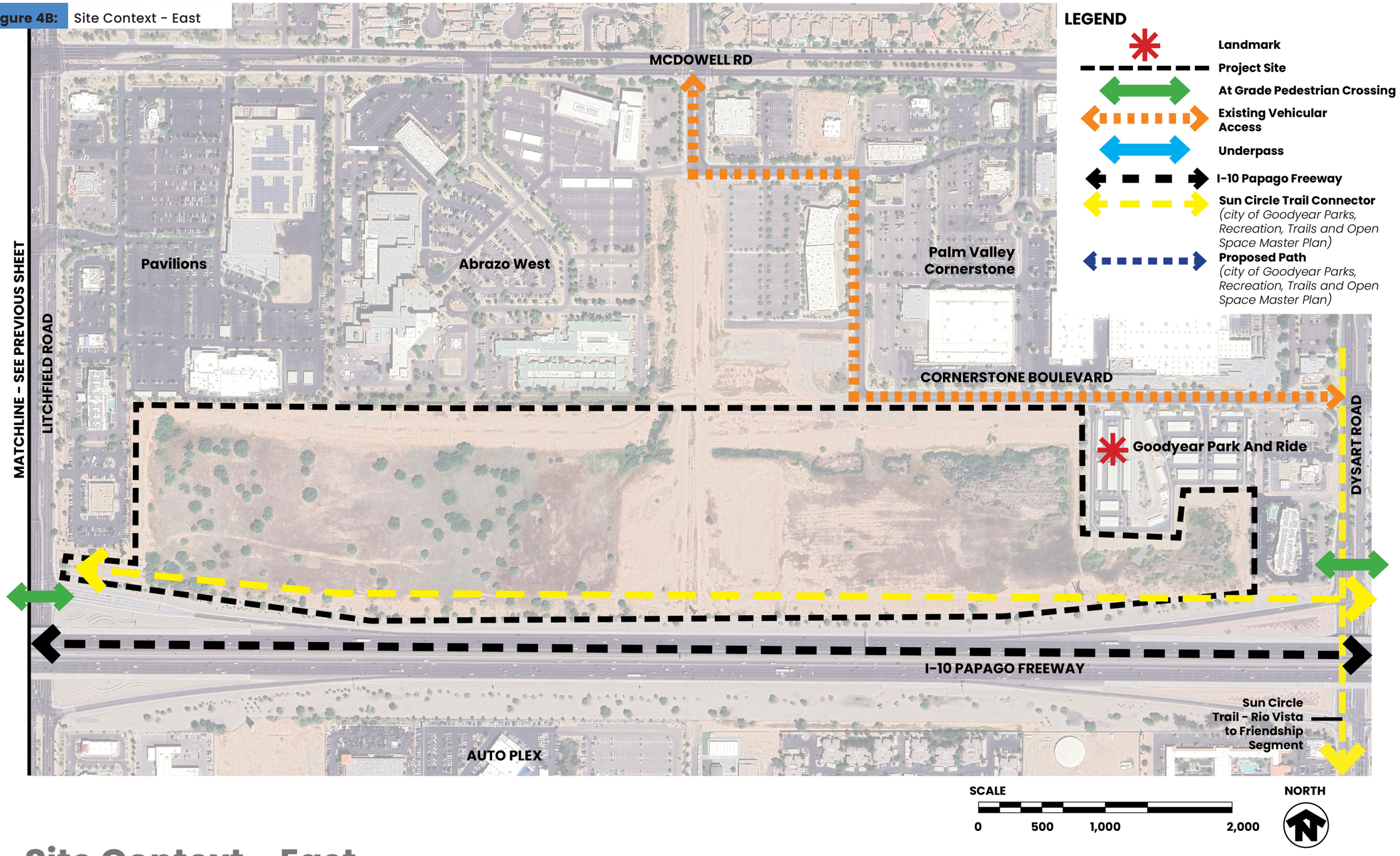
Surrounding Land Use - East

Figure 4A: Site Context - West



Site Context - West

Figure 4B: Site Context - East



Site Context - East

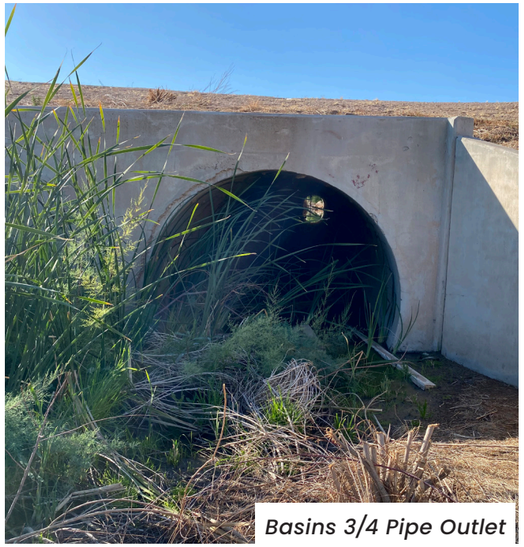
2.3 Drainage & Hydrology

The four basins located north of I-10 between Bullard Avenue and Dysart Avenue serve as regional detention basins, collecting stormwater runoff from a contributing area to the north of approximately 7 square miles (*see Figure 5*). Generally, stormwater runoff within the vicinity is from north to south, with the basins collecting runoff from an area extending north to Camelback Rd and bound by Bullard Avenue to the west and Dysart Road to the east. The basins are approximately 10'-15' deep and interconnected, with the easternmost basin located at the lowest elevation. The culvert structures connecting the basins beneath the railroad property, Litchfield Rd, and the Palm Valley/ Central Avenue alignment vary in size from 48" to 2-84" diameter pipe culverts. The ultimate outfall is a 48" pipe located in the southeast corner of the easternmost basin. This outfall conveys stormwater runoff from the basins to the Agua Fria River with an outlet located immediately south of Van Buren St.

The hydrologic model of record is the Loop 303 Corridor/White Tanks Hydrology and Delineation Update, developed by Parsons Brinckerhoff in August 2015. Basin inflows and function were analyzed using the US Army Corp of Engineers' HEC-1 software. Within the accompanying Flood Control District Contact FCD 2014C003, Parsons Brinckerhoff also performed Optional Task 1, with the purpose of investigating and hydrologically analyzing the existing developments within the contributing area to the ADOT basins. This report, included in Appendix C, serves as the latest analysis of the ADOT basins, and documents freeboard values (from the maximum water surface elevation to the top of the basins) of 7'-11' during the 100-year 24-hour design storm event.

A series of Federal Emergency Management Agency (FEMA) floodplain delineations are also located within all four basins. The current Flood Insurance Rate Map (FIRM) for the subject area is 04013C2155M, published in September 2020, and shows Zone AH designations within each basin with an associated water surface elevation of 985.00'. Zone AH is defined by FEMA as "areas with a 1% annual chance of shallow flowing, usually in the form of a pond, with an average depth ranging from 1 to 3 feet." The FIRM exhibit is included in Appendix D. Development within the basins that may alter floodplain delineations will require coordination and approval from the city of Goodyear, serving as the local floodplain administrator, with further potential review and approval from FEMA. City will determine if Conditional Letter of Map Revision/Letter of Map Revision (CLOMR/LOMR) is required.

Drainage features including inflow locations, FEMA floodplain delineations, culvert locations and sizes, and the HEC-1 schematic associated with the model of record are shown on the following pages (*see Figures 6, 7A &7B*).



Basins 3/4 Pipe Outlet



Pipe Outlet Headwall

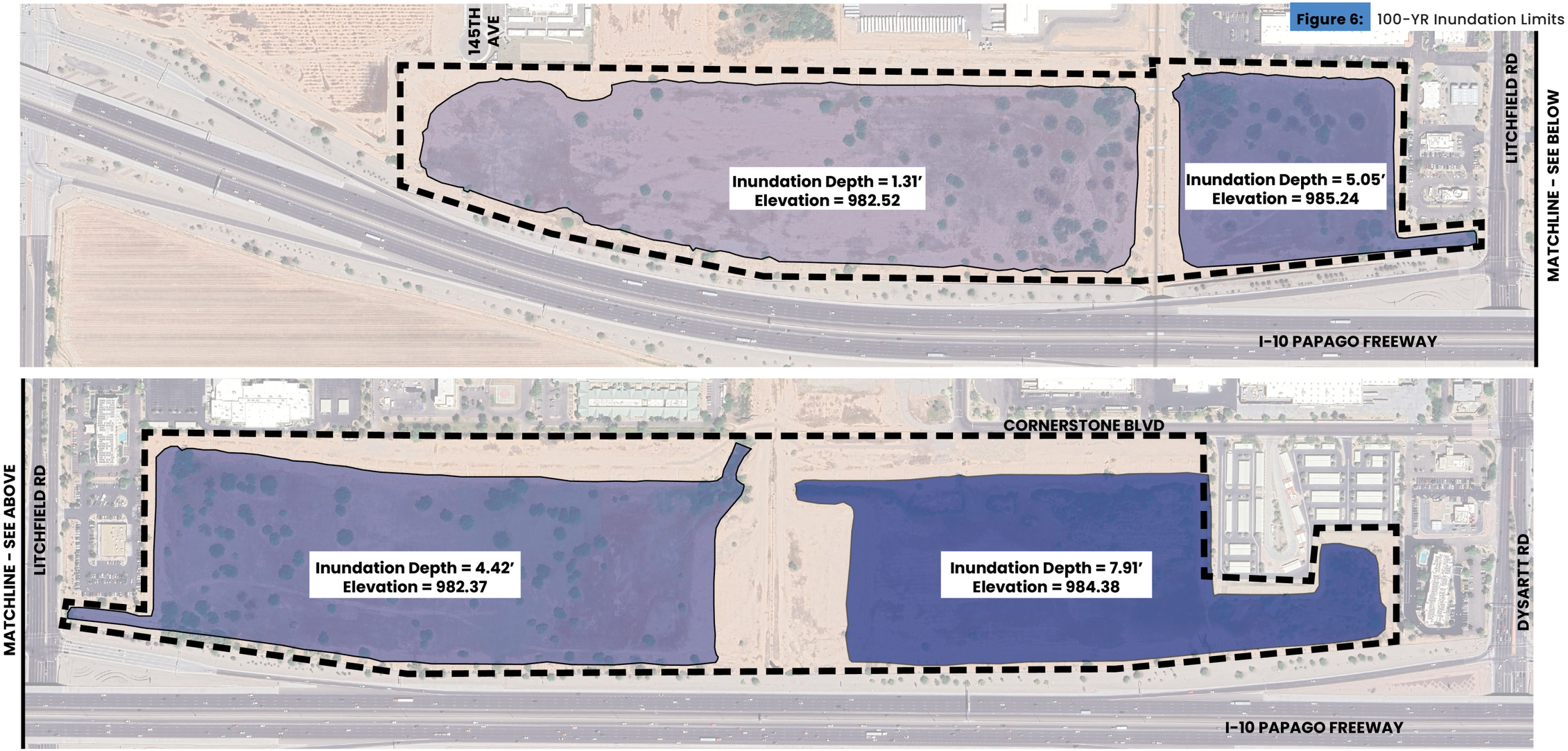


Palm Valley Inflow Box Culvert



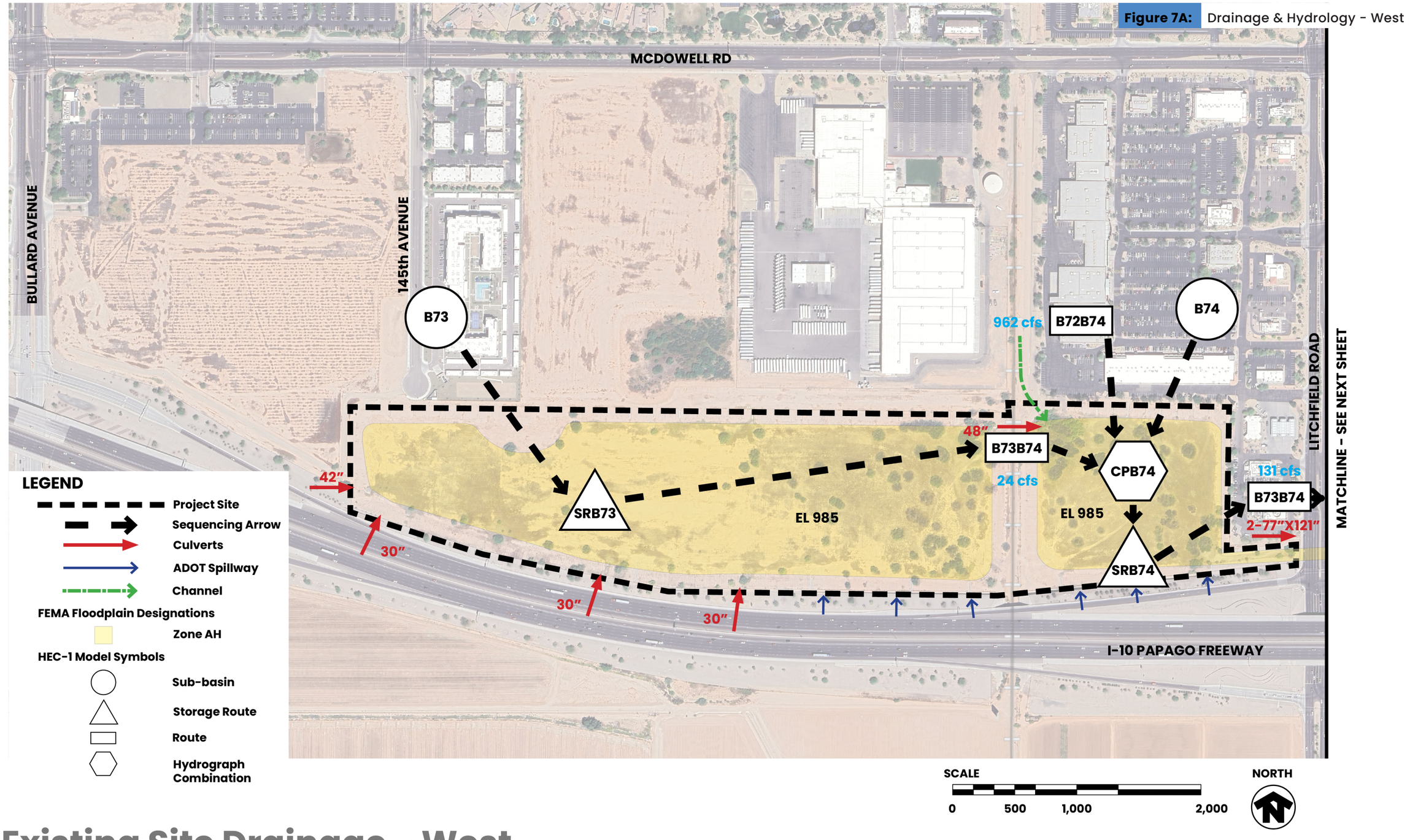
Figure 5: Watershed Map

Figure 6: 100-YR Inundation Limits



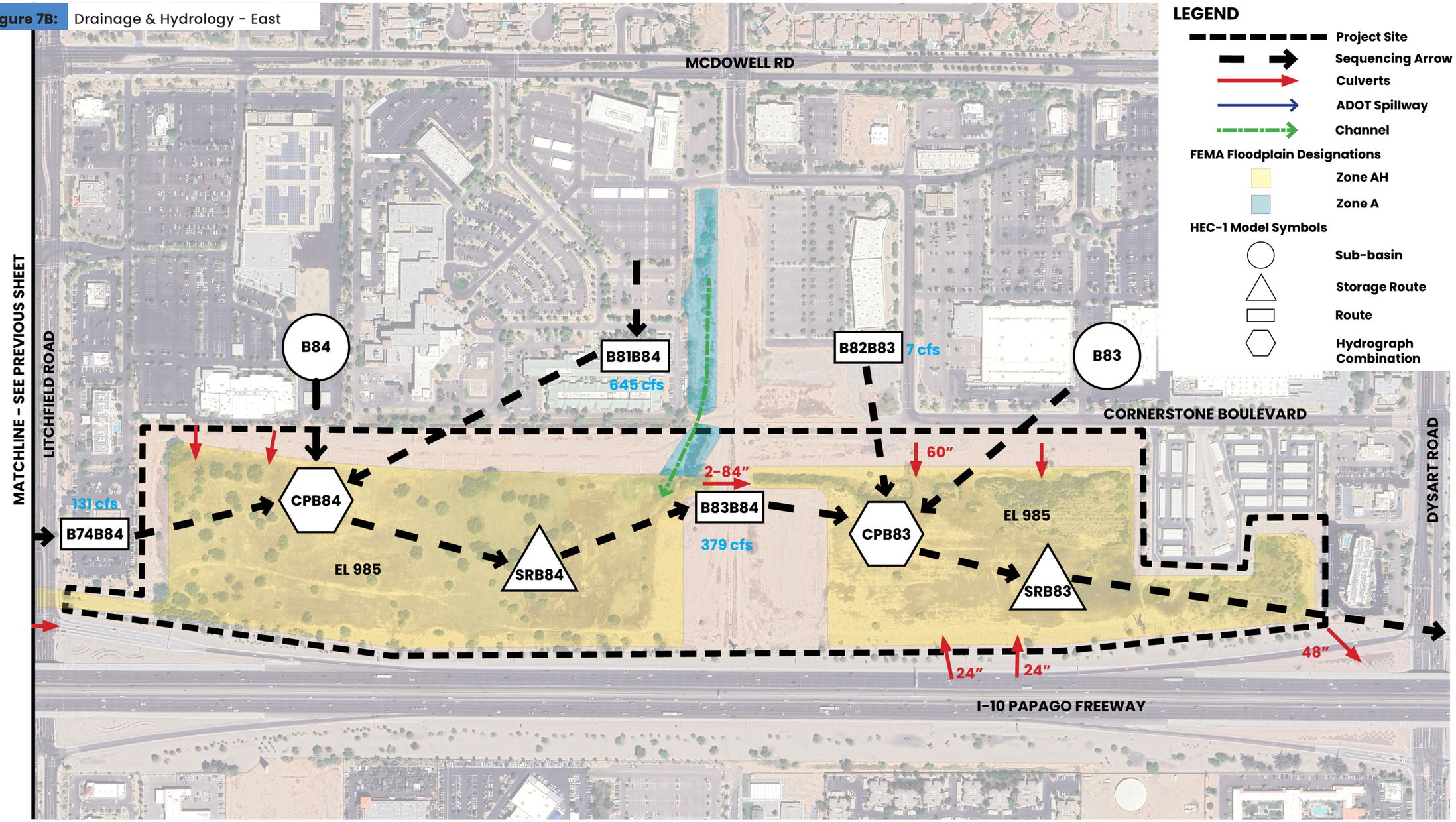
Existing 100 Year Inundation Limits

Figure 7A: Drainage & Hydrology - West



Existing Site Drainage - West

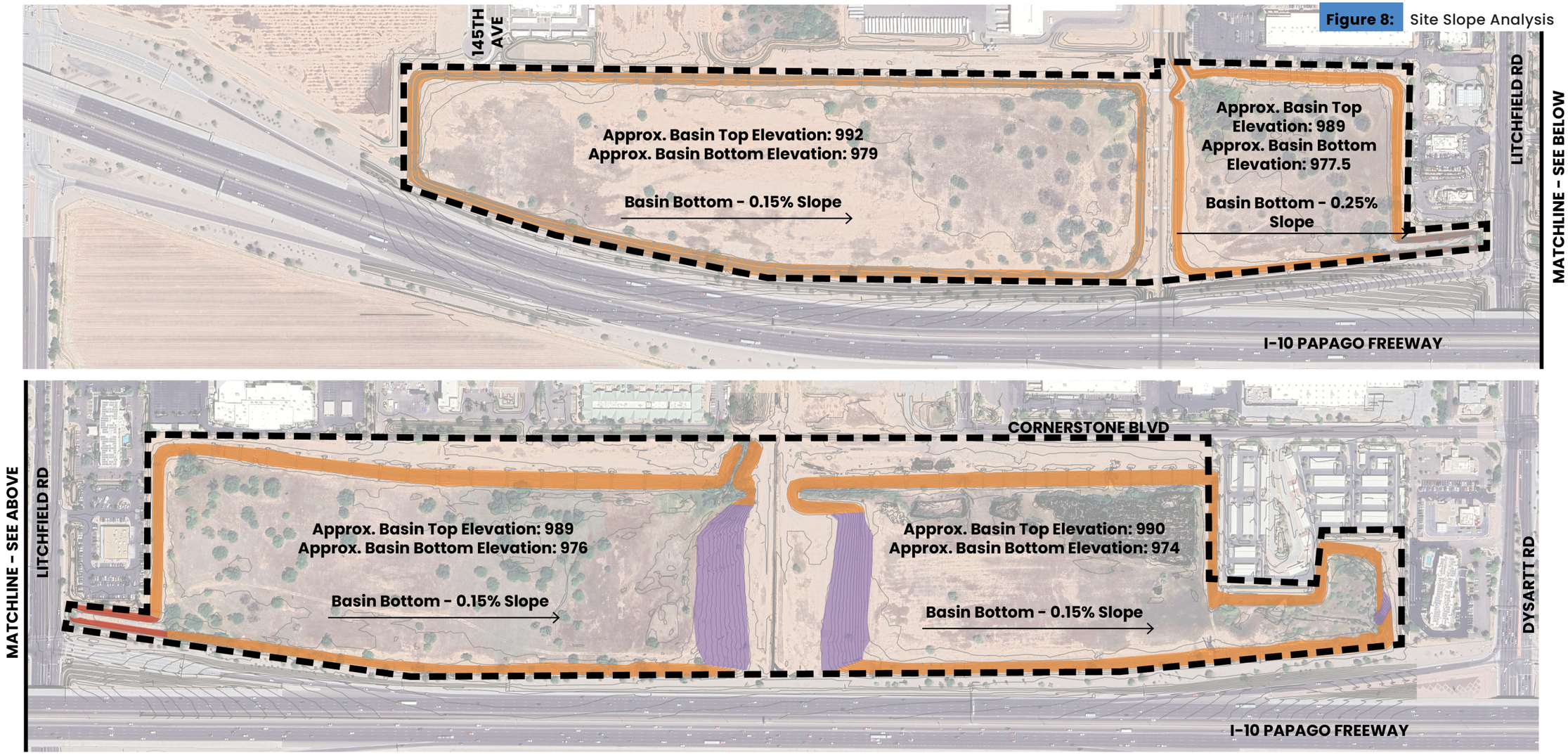
Figure 7B: Drainage & Hydrology - East



Existing Site Drainage - East

The site as a whole is generally flat and has a steady slope to the east at a gradual rate. Side slopes surrounding the basins are consistent around with more gradual slopes that bisects the eastern basins.

Figure 8: Site Slope Analysis



Site Slope Analysis

2.4 Site Utilities

This report evaluated the typical park utilities such as sewer, potable water, non-potable water and electricity (*see Figures 9A & 9B*). This site has several unique utility based challenges that will need to be addressed in the development of the sports complex, these challenges include:

1. A future Arizona Public Service (APS) 230kV electrical transmission line.
2. Existing ground water remediation extraction wells, injection wells and ground water treatment facilities.
3. The site sits within the service areas of both Liberty Utilities and the city of Goodyear for potable water and sewer.

Natural Gas

The project site is within the Southwest Gas service area. There are 4" & 6" gas distribution lines in McDowell Road. There are 4" gas distribution lines in Litchfield Road, Dysart Road and Bullard Road. There are 2" and 4" gas distribution lines in Cornerstone Boulevard. There do not appear to be any high pressure gas transmission lines within the project study area.

Sewer Service

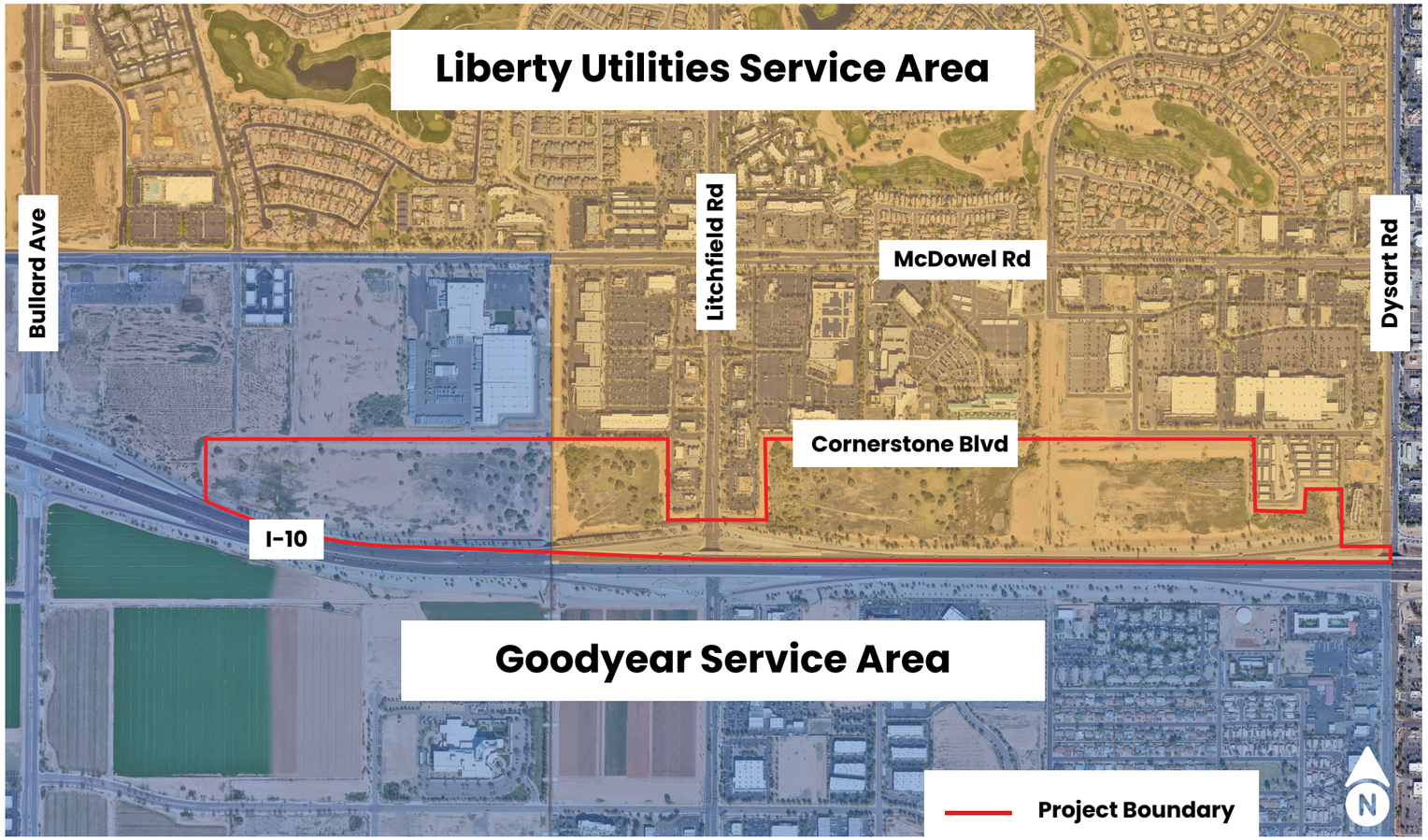
Liberty Utilities provides sewer service to the east of the UPRR property. They have a 24" and a 30" sewer main in McDowell Road, a 12" sewer main in Litchfield Road and an 8" sewer main in the north/ south segment of Cornerstone Boulevard. The city of Goodyear provides sewer service west of the UPRR property. They have an 8" sewer main in 145th Avenue.

At the south end of 145th Avenue, adjacent to the site is the Sparrow Sewer Lift Station, which has a 4" sewer force main that runs to the west and connects to a gravity sewer system that continues to the west toward Bullard Avenue. Depending on final design, restroom facilities may require a localized lift station for disposal.

Potable Water

Liberty Utilities provides potable water service to the east of the UPRR property. They have a 12" water main in McDowell Road, a 16" water main in Litchfield Road and an 8" and a 12" water main in Cornerstone Blvd.

The city of Goodyear provides potable water to the west of the UPRR property. They have a 12" water main in McDowell Road and a water main in 145th Avenue.





Sewer Lift Station & APS Transformer

Non-Potable Water

Liberty Utility has a 12" effluent water line in McDowell Road. This line has a typical pressure of 30 psi and has a maximum pressure of 85 psi. Based on 2023 water usage, the system produced on average about 3,833 gallons per minute (GPM) during June and July with a maximum flow of about 4,395 GPM. Of that amount, they have about 1,815-2,315 GPM typically sold or allocated during those months, which leaves about 1,800-2,300 GPM available for new customers. This is only reflective as of 2023 and could change moving forward. Liberty is currently in the process of constructing a new Water Reclamation Facility off of Camelback Road and Sarival Road which will add capacity to the effluent system. This new Facility is expected to be operational by May/June of 2024.

It is believed that non-potable water from Liberty Utilities could be used to irrigate grass in the Goodyear service area, but the Liberty water lines and water meters would have to be located within the Liberty service area.

Goodyear has a 20" reclaimed water line in Bullard Avenue, but the city is not currently using the water for development projects because the city is using the water for ground water recharge credits.

Electricity

The project site is within the APS service area. A network of underground and overhead power lines are located along all the surrounding arterial roads and there are several transformers located along the project site edges. Two sets of overhead power (OHP) lines run north/ south though the site. One set runs along the Palm Valley alignment and crosses over the I-10 freeway. The second set of OHP lines runs down the UPRR property and converts to underground to cross under the I-10 though the UPRR underpass.

APS is currently designing the Three Rivers Sub Compass 230 kV line project. The current alignment has 230 kV power lines bisecting the site in an east/ west direction within a 90' wide APS power line easement paralleling directly north of the I-10. Development within the APS power line easement will be restricted to approved activities that meet the easement restrictions (*see Appendix for draft easement documentation*).

Communications

Century Link has primary service lines in McDowell Road, Litchfield Road, Cornerstone Boulevard and the northern half of the UPRR property.

Cox Communications has primary lines within McDowell Road, Litchfield Road, Cornerstone Boulevard and 145th Avenue right-of way. There are primary underground lines adjacent to the project site on the Palm Valley Pavilions and Abrazo Health properties. There are also overhead lines that run north/south along the Palm Valley alignment and in the UPRR property.

Verizon has a primary line in McDowell Road and portions of Cornerstone Boulevard.

Crane Plumb Ground Water Remediation (See Section 2.5 for Additional Information)

The Crane Plumb runs through the center of the site along Litchfield Road. Crane Water operates the following facilities within the project area and will need to be protected from any site development:

- Two extraction wells (EA-05 & EA-12)
- Two injection wells (IA-10 & IA-20)
- One treatment site (EA-05 GTS)
- Two monitoring wells (MW-15 & MW36A)
- Two Piezometers (PZ-20 & PZ-20A)
- Associated piping within the project site

On other existing city parks, the city of Goodyear has entered into an agreement with Crane Water to utilize the water for irrigation purposes. After the water has been treated, it can be used on the sports complex to supplement the irrigation. Crane produces and treats millions of gallons a year of contaminated ground water. A certain amount of that water must be re-injected back into the ground to contain the trichloroethylene (TCE) plume so the amount of water available for irrigation will need to be determined through future negotiations with Crane Water and the Environmental Protection Agency (EPA). It is anticipated that the future amount of water needed to contain the TCE plume will be reduced. Any use of the treated water would require approval by the EPA.

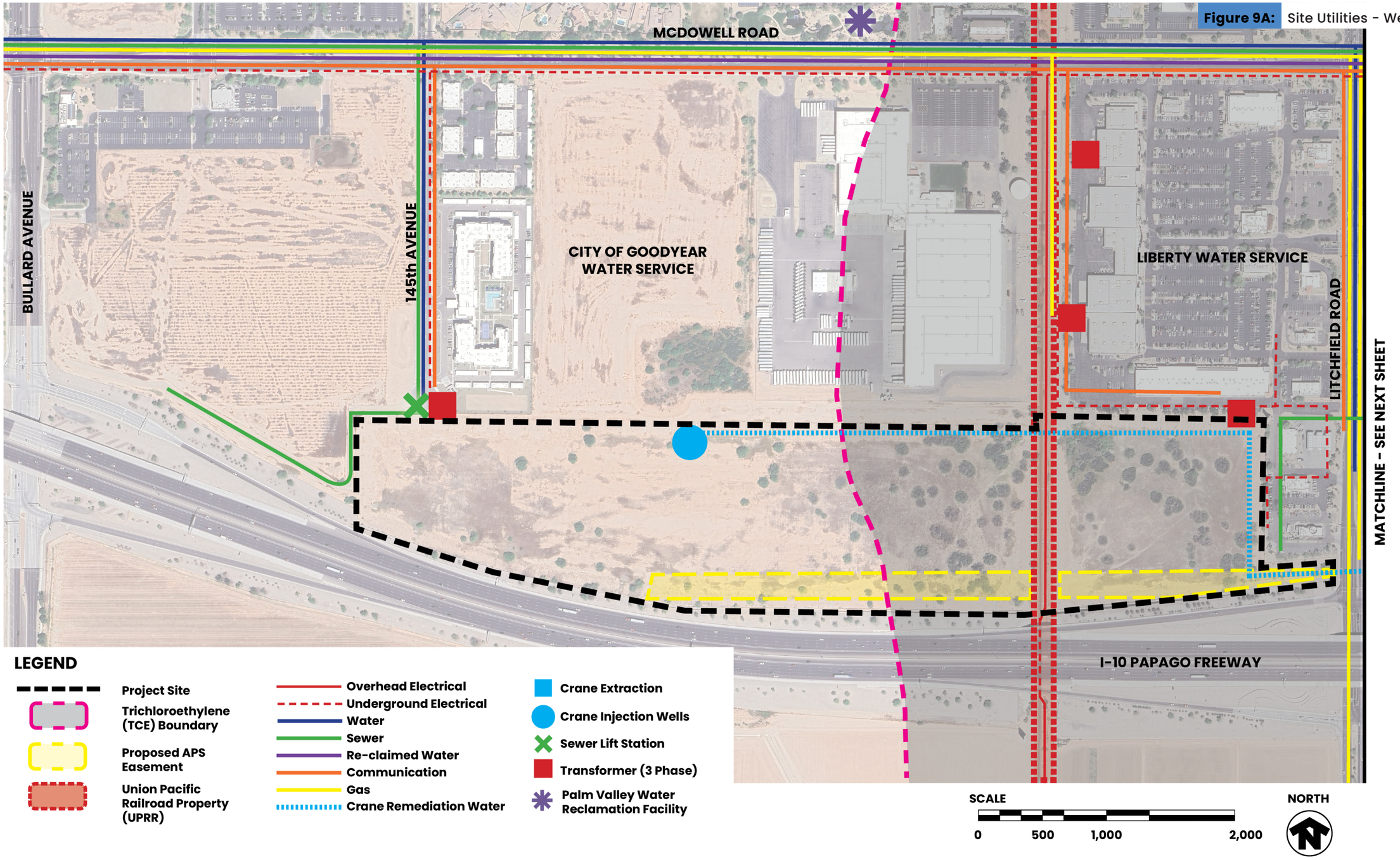


Sewer Manhole


Utilities on UPRR on Property

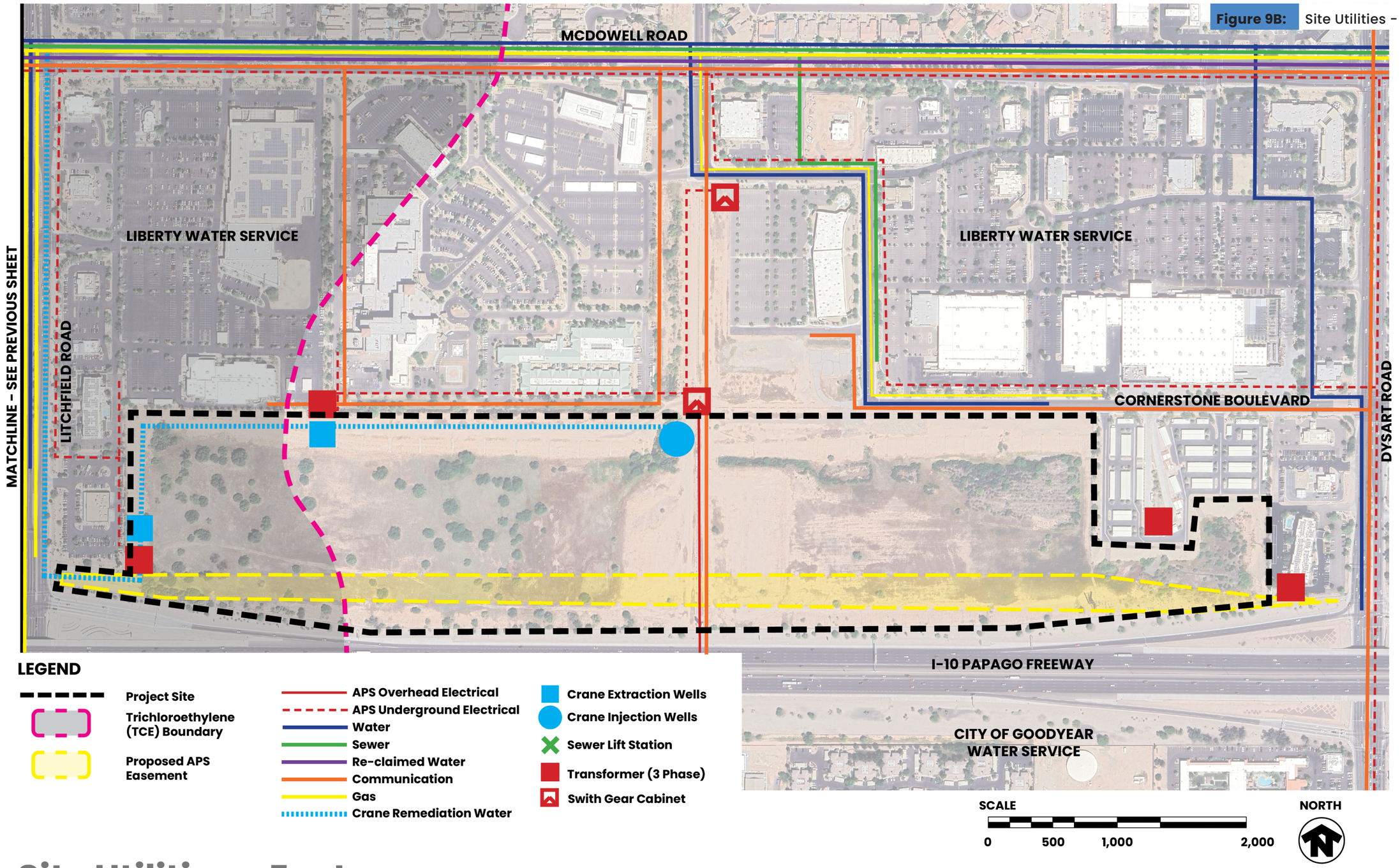

Backflow Preventer

Figure 9A: Site Utilities - West



Site Utilities - West

Figure 9B: Site Utilities - East



Site Utilities - East

2.5 Environmental

A Phoenix Goodyear Airport (PGA) Superfund Site, known as the Crane Plume, covers approximately 35 square miles in the city of Goodyear. The northern portion, or PGA North, is the site of the former Unidynamics Phoenix, Inc. manufacturing plant and sits within the limits of the project site. Operations at the former Unidynamics plant began in approximately 1963 and consisted of developing and testing defense and aerospace equipment, systems and munitions. Chemicals, oil and powders containing trichloroethylene (TCE), toluene, acetone, methanol, cobalt nitrate, ammonium carbonate, perchloric acid and fuel were used on the site and then disposed of in 11 dry wells and 2 unlined oxidation ponds. TCE is the principal contaminant at the site and was used as a cleaning solvent at the former Unidynamics plant. Lesser amounts of perchlorate, an oxidizer, contamination also exists at the Site.

The EPA and the Arizona Department of Environmental Quality (ADEQ) have been investigating the contamination to the soils and groundwater below the PGA South Superfund Site and have been attempting to remediate it since 1981. In 1983, the EPA added both the PGA South and the PGA North sites to its National Priorities List; which is a list of sites across the nation that pose a risk to human health, welfare, or the environment, that need to be cleaned up to eliminate or reduce such risks. Soil and groundwater cleanup efforts began at PGA North in 1994. Groundwater occurs in unconsolidated alluvial sediments at the Site, generally consisting of silts and sands with some gravels and clays. Groundwater at the PGA North site is deep below the ground surface, ranging from approximately 60 feet below ground surface (bgs) in the south to 120 feet bgs in the northern portion of the site. Although there is currently no exposure to TCE impacted water, historically several city of Goodyear municipal supply wells and Suncor irrigation wells have been abandoned due to TCE contamination (*see Figure 10*).

Soils

Ricker Atkinson McBee Mormon & Associates (RAMM) performed six (6) geotechnical borings and two (2) percolation tests within the site area. See the Geotechincal Report in Appendix C for the results of the testing and recommendation for development of the site based on the sub-surface conditions. Soil in the basins west of Litchfield Road consisted of medium dense to dense silty sand with a trace of some gravel and non-plastic fines. The basins east of Litchfield Road are stiff to very stiff, low to medium plasticity sandy clay with a trace amount of gravel and light cementation.

An existing large stock pile of river rock is located in the far east basin. This rock could be used as fill material to elevate sections of the park above flood elevations or used as erosion protection.



Piezometer



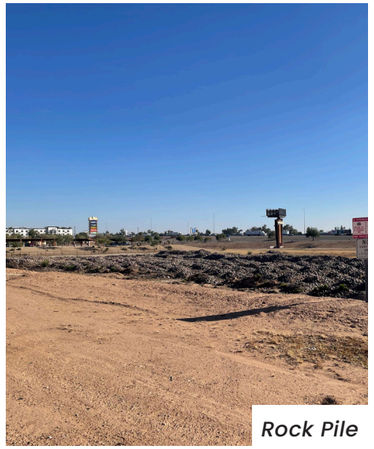
TCE Water Treatment Tanks



Injection Well

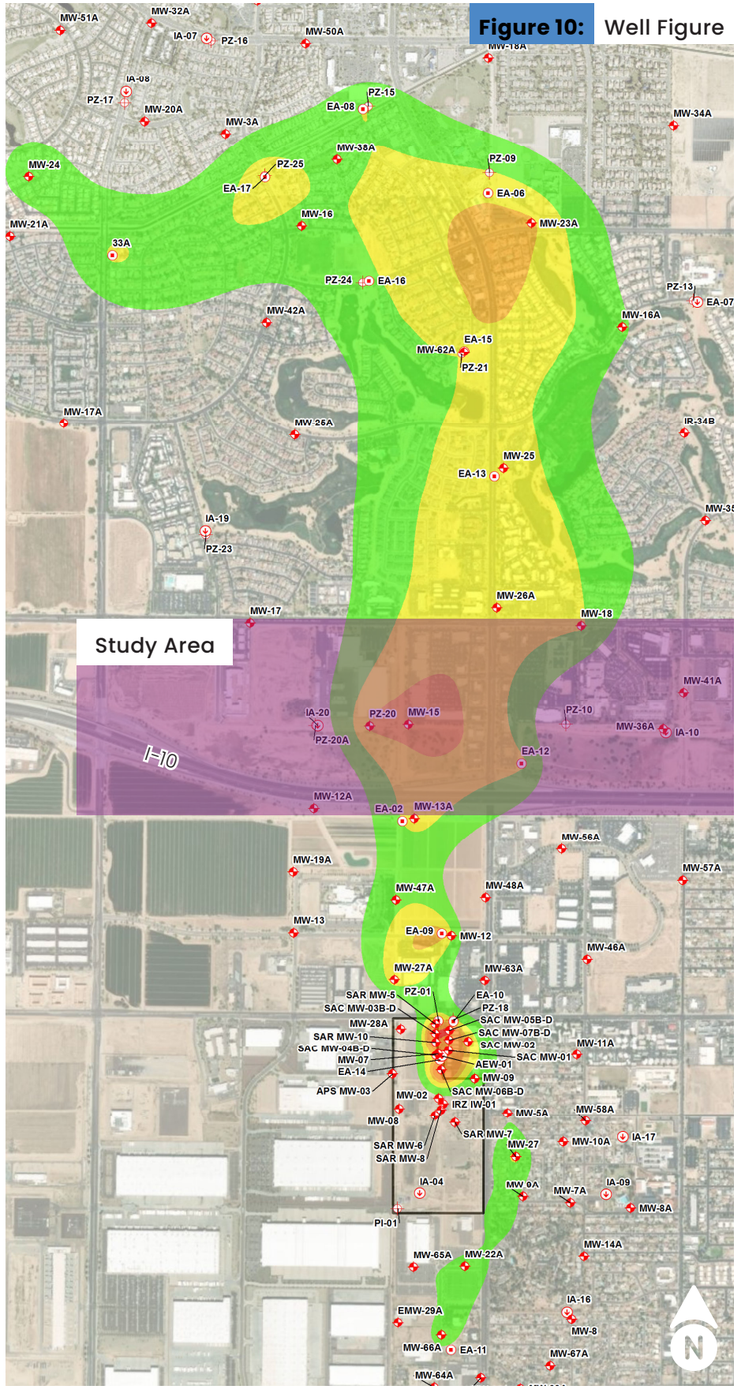


Rock Pile



Rock Pile

Figure 10: Well Figure



2.6 Site Access

Unfortunately, the vehicular site access into the Goodyear Sports Complex study area is limited. Direct access off Litchfield Road is not feasible given the proximity of the ADOT access ramps to the I-10 Freeway.

East of Litchfield Road, the possible vehicular access points are:

1. Extend Palm Valley Boulevard approximately 865' south to the project site. This will require extending the right-of-way through the Adelante Health Center property.
2. Cornerstone Boulevard provides approximately 900' of direct site access.

West of Litchfield Road, the possible vehicular access points are:

1. 145th Avenue provides a direct access point to the site.
2. A 50' wide United Pacific railroad (UPRR) property runs along the 140th Avenue alignment between a commercial development and McLane/ Sunwest building. Obtaining an access or use easement would require obtaining UPRR permission to utilize their property. The UPRR property also contains overhead APS power and telephone lines and a Crane Water treated waterline.
3. Extend a new road through un-developed land that is owned by McLane/Sunwest possibly along the 143rd Avenue alignment. This would require obtaining new property/right-of-way from McLane/ Sunwest.

East of Litchfield Road, there is a high likelihood of pedestrians accessing the site from adjacent commercial properties. There is not any access control fencing at the park & ride or hospital facilities, however there is an access control fence between the businesses on the east side of Litchfield Road and the site.

West of Litchfield Road there is an access control fence behind the businesses on the west side of Litchfield Road and the site. However, there is not an access control fence between the strip mall and Best Buy to the north of the project site.

The only possible pedestrian connection between the east and west project sites occurs at Litchfield Road between the commercial developments and the ADOT ramps where an 800' concrete drainage channel under Litchfield connects the two basins. A pedestrian connection would either have to go under Litchfield Road or over the road. The drainage between the basins would need to be accommodated.

The Goodyear Parks & Trails master plan identifies two planned trails through the site.

1. The Rio Vista- Friendship segment of the regional Sun Circle Trail is located at Dysart Road and I-10. Coordination with ADOT would be required to gain access to a small portion of ADOT right-of way to make the trail connection from Dysart to the Goodyear Sports Complex property. A connection though the park is planned to connect to the city's Bullard Wash Trail System to the west. A sewer line maintenance road on Sunbelt Centerscape-Sarival property connects the site to Bullard Road to the west. The Bullard Wash Trail is a half mile west of Bullard Road.
2. A planned trail runs north/south on the UPRR property from McDowell Road to the I-10 underpass and could connect the park to the Cancer Treatment Center of America that is south of the I-10 freeway (*see Figure 11*).



UPRR Underpass



UPRR Property - North



145th Avenue Cul-de-Sac



Cornerstone Boulevard

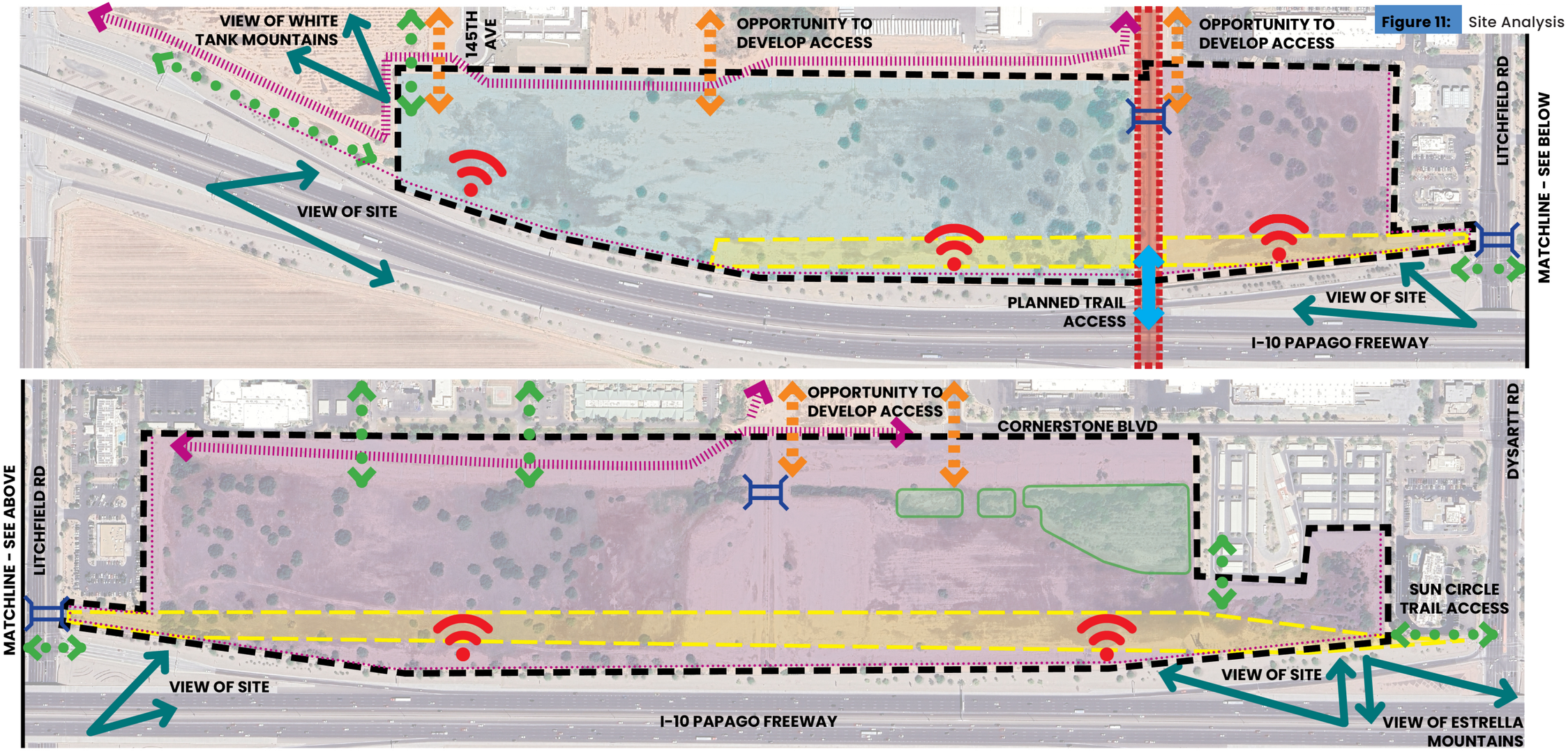


Figure 11: Site Analysis

Site Analysis

Part Three

Preferred Alternative

3.0 PREFERRED ALTERNATIVE

Three conceptual plans were developed and thoroughly evaluated as part of the process to determine the preferred alternative. The Preferred Alternative developed for the Goodyear Sports Complex utilizes four (4) detention basins which function as a new soccer and pickleball destination, serving local and regional sports teams, clubs, events, and competitions. To enhance parking distribution and create a distinction between the fields and drainage areas, single loaded parking lots are strategically placed on each side of the fields. The drainage areas, situated on the southern side of the site and within the APS easement, will undergo improvements with the installation of new drainage pipes. These pipes will effectively connect the separate basins, ensuring efficient drainage. Positioned at the far west end of the site is a spacious 50,000 square foot training building. This building serves as a dedicated facility for training purposes. Additionally, the pickleball courts are thoughtfully separated from the soccer fields and have their own designated parking lot. This segregation ensures that users of the pickleball courts do not mix with those utilizing the soccer fields, providing a more organized and user-friendly experience for all. The preferred alternative site plan includes the following site amenities (*see Figure 12*).



Figure 12: Preferred Concept Plan

Amenities

- Turf Soccer Fields
  - 11 Sand Base Turf Grass Soccer Fields w/ Lighting (225' x 360')
  - 4 Native Base Turf Grass Soccer Fields w/ Lighting (225' x 360')
  - 1 U-12 Size Sand Base Turf Grass Soccer Field w/ Lighting (150 x 225')
- 48 Pickleball Courts w/ Lighting
- 4 Shade Ramadas at Pickleball Courts
- 1 Restroom/Office Building (4,000 SF)
- 2 Small Restroom Buildings (800 SF)
- Shade Trees for Walking Pathways w/ Lighting
- Parking Lots w/ Lighting (2,232 stalls)
- Parking Lot Screen Walls
- Wayfinding Signage
- 2 Entry Monuments
- 2 - 1 ac Maintenance Yards with Service Bays
- 1 - 1,000,000 gal Irrigation Storage Tank (38' ht)
- 1 - 1,270 GPM Irrigation Booster Pump w/ Shade Canopy
- 1 - 765,000 gal Irrigation Storage Tank (20' ht)
- 1 - 775 GPM Irrigation Booster Pump w/ Shade Canopy
- Potable Water Connections to both city of Goodyear and Liberty Utilities
- Sewer Connections to both city of Goodyear and Liberty Utilities
- Reclaimed Water Connection to Liberty Utilities
- Electrical Service Connections to APS
- New Landscape - approximately 1,500 trees, 2,700 shrubs and 1,200 accents/ cacti

The design team has faced and resolved a number of site challenges throughout the process of developing the Preferred Alternative site plan. Some of these challenges include:

Project Challenges:

- 3.1 Grading & Drainage
- 3.2 Site Access
- 3.3 Parking and Circulation
- 3.4 Wet Utilities
- 3.5 Irrigation Supply & Distribution
- 3.6 Electrical Power
- 3.7 Future APS Easement
- 3.8 Landscape Character
- 3.9 Project Assumptions

3.1 Grading & Drainage

As previously discussed in the Site Analysis section, the project location is currently designated as a regional detention basin system. Naturally, this creates a challenging system to manage in terms of the amount storm water draining into the site. Site amenities must be elevated above specific storm events to avoid interruption of recreation activities and the costly maintenance needed to repair or clean the complex. The Preferred Alternative uses the following parameters to determine the elevation of the site amenities in efforts to avoid storm water inundation:

Feature	Level of Protection from Storm Water Inundation
Parking Lots	10-Year
Sand Base Natural Soccer Turf Fields	10-Year
Pickleball Courts	50-Year
Restroom Buildings	100-Year
Maintenance & Irrigation Pump Yard	100-Year

The drainage areas that are proposed on the southern portion of the site are there due to the location of the ADOT pipes, to take advantage of the existing elevated slopes on the northern portion of the site, and to keep the storm water away from the recreation amenities. New pipes and box culverts will allow water to continue to flow from west to east between the existing detention basins (*see Figure 13*). To achieve this, a large amount of soil will need to be imported to the site to elevate the proposed amenities above the storm water detention elevations (*see Figure 14*).

The most recent analysis of this regional detention basin system was performed by Parsons Brinckerhoff (PB) in August 2015 as part of the Loop 303 Corridor/White Tanks Hydrology and Delineation Update Phase 1 – Updating the Existing Hydrology Model, Optional task #a – ADOT Basins Watershed and White Tanks FRS No. 4 Outfall (Flood Control District Contract No. 2014C003). In this analysis, PB determined the contributing watershed to the four (4) ADOT basins, evaluated deficiencies in upstream onsite retention within residential areas north of McDowell Rd, and presented maximum Water Surface Elevations (WSELs) and freeboard values within the basins associated with the 100-year storm event. Comparison of the 100-year HEC-1 models developed by PB with as-built plans for the Ehrenberg-Phoenix Highway. Bullard Ave – Dysart Rd indicate that the models of record are developed within the National Geodetic Vertical Datum of 1929 (NGVD 29). This datum has been superseded by the North American Vertical Datum of 1988 (NAVD 88).

HEC-1 sub-models pertaining to the watershed contributing to the ADOT basins were updated by J2 to evaluate impacts to WSEL and freeboard when changing geometry throughout the basin system. The preferred alternative presents an opportunity to revise the size and shape of culverts connecting the basin system beneath the UPRR alignment and the Palm Valley alignment. The hydrologic analysis of the preferred alternative ponding utilizes rating curves based on existing culvert sizes.

Under the existing condition, runoff enters the basins from several directions, including:

- Storm drain pipe outlets within south embankment conveying onsite stormwater runoff from ADOT right-of-way
- Offsite channel entering Basin 2 along UPRR alignment
- Offsite channel entering Basin 3 along Palm Valley alignment
- Storm drain pipe outlet within Basin 4 conveying onsite stormwater runoff from commercial properties to the north
- Spillways located along north embankment slopes to convey nuisance flow from vacant areas to the north of the basins.

The ultimate outfall from the detention basin system is a 48" diameter storm drain located at the southeast corner of Basin 4. This 48" storm drain runs approximately 1 mile to the south/east, outletting into the Agua Fria River at Van Buren St.

The Preferred Alternative modifies the elevation-volume characteristics of each basin, impacting the combined performance of the basin system as a stormwater detention facility. The Preferred Alternative generally reduces the provided retention volume from the existing condition and results in higher Water Surface Elevations while still maintaining sufficient freeboard to the breakout elevation at the top of each basin.

The following table summarizes Water Surface Elevations associated with three storm return intervals within each basin under the Preferred Alternative.

Basin	Basin 1	Basin 2	Basin 3	Basin 4
Breakout Elevation	987.00'	987.00'	986.00'	987.00'
100-Yr WSEL	982.52'	985.24'	982.37'	984.38'
50-Yr WSEL	982.34'	984.07'	981.38'	981.73'
10-Yr WSEL	981.81'	981.42'	979.20'	976.86'

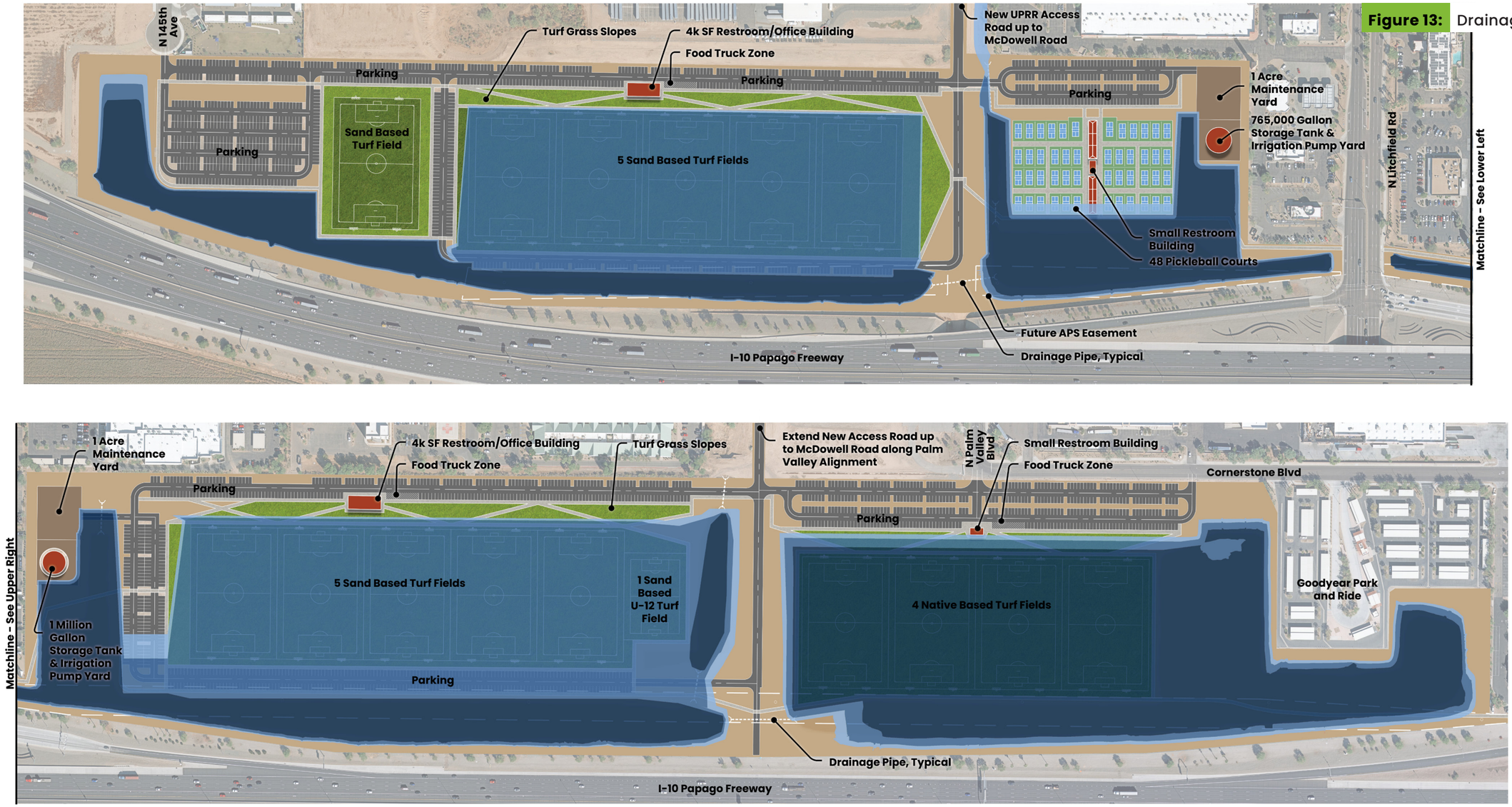
Basin	Freeboard 10-Yr	Freeboard 50-Yr	Freeboard 100-Yr
1	5.19'	4.66'	4.48'
2	5.58'	2.93'	1.76'
3	6.80'	4.62'	3.63'
4	10.14'	5.27'	2.62'

Since the site will be graded to elevate recreation and parking amenities above storm water event the site grades will be as steep as possible to minimize import of fill material. Slopes that are covered with decomposed granite and planted with low-water desert trees and shrub will be at a maximum of 4:1 slope. Turf grass slopes will be at a maximum of 6:1 slope to allow for mowing of slopes (*see Figure 18*).



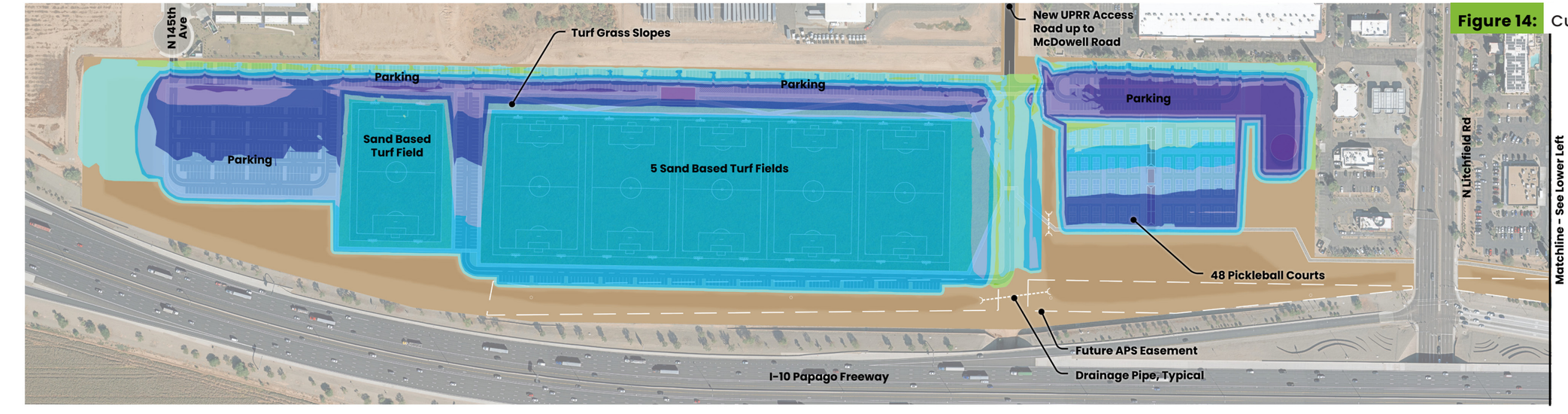
Existing Drainage Channel along UPRR Alignment

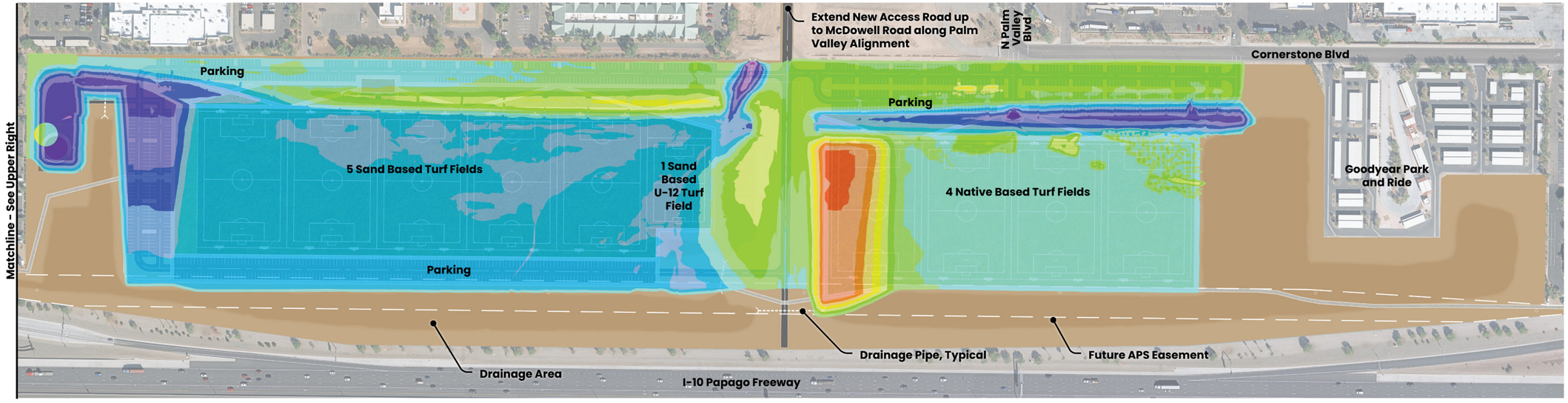
Figure 13: Drainage Plan



Goodyear Sports Complex | Preferred Site Plan - Drainage

Figure 14: Cut/Fill Plan





LEGEND

MINIMUM ELEVATION	MAXIMUM ELEVATION	AREA	COLOR
-16.000	-14.000	12998.05	
-14.000	-12.000	37251.00	
-12.000	-10.000	15942.18	
-10.000	-8.000	15768.25	
-8.000	-6.000	21444.26	
-6.000	-4.000	71693.59	

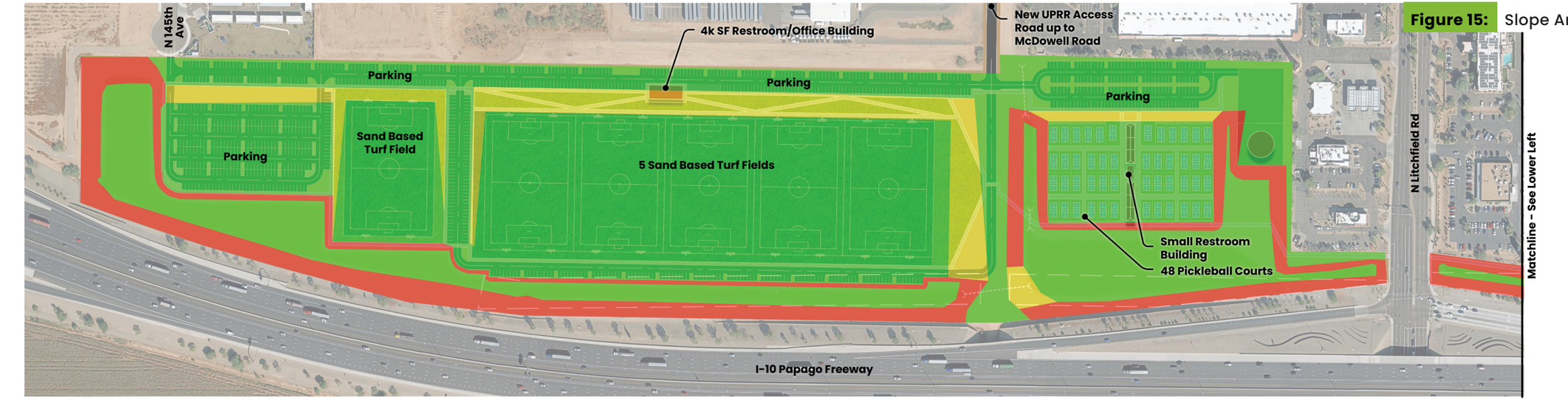
MINIMUM ELEVATION	MAXIMUM ELEVATION	AREA	COLOR
-4.000	-2.000	271096.71	
-2.000	0.000	289862.38	
0.000	0.000	UNDISTURBED	
0.000	2.000	703723.74	
2.000	4.000	1669404.97	
4.000	6.000	474256.90	

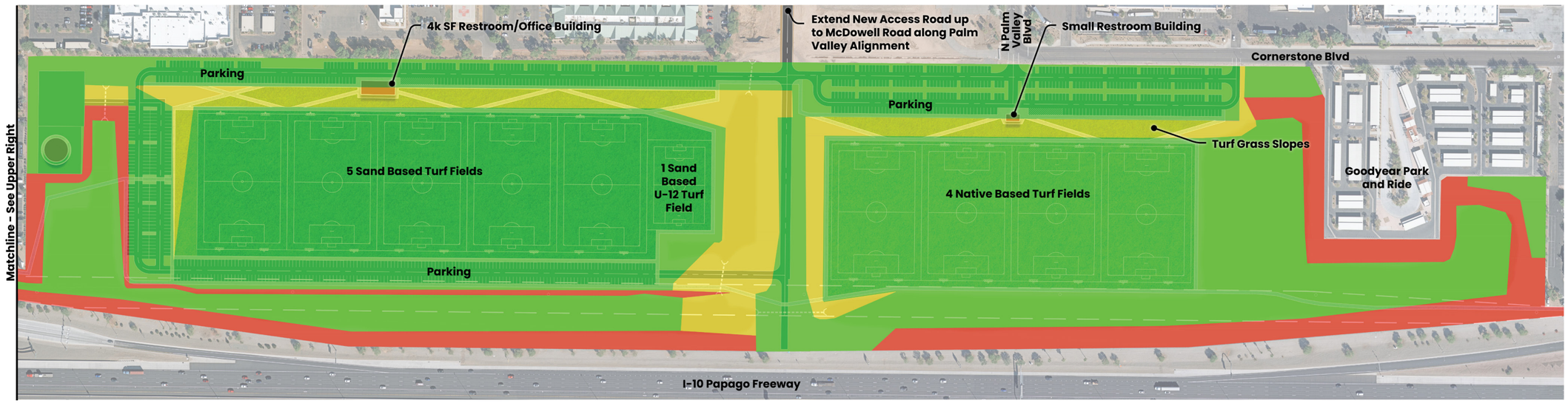
MINIMUM ELEVATION	MAXIMUM ELEVATION	AREA	COLOR
6.000	8.000	300318.17	
8.000	10.000	189640.92	
10.000	12.000	112477.56	
12.000	14.000	2045.49	
14.000	16.000	79.73	

0 130' 260'

Goodyear Sports Complex | Preferred Site Plan - Cut/Fill Analysis

Figure 15: Slope Analysis





Goodyear Sports Complex | Preferred Site Plan - Slope Analysis

3.2 Site Access

Vehicular access to both the east and west sport complex areas are limited because of the I-10 freeway and the existing dense commercial development surrounding the site. Given the high amount of people that may attend any given event at the sports complex, it is critical to ensure sufficient ingress/egress to and from the site.

The west sports complex has a good access point at 145th Avenue, which is adjacent to the site and already has a stop light at McDowell Road. The only other possible access point is along the UPRR property. The city of Goodyear does not currently have access rights, and recent conversations with UPRR suggest that they would be open to selling that property to the city at fair market value. The UPRR property is 50' wide and stretches 1,335' to McDowell Road and has existing power lines and a Crane water line in it. At McDowell Road, a stop light would likely be needed, following a traffic study which analyzes the existing and proposed conditions.

The east sports complex has a good access point along Cornerstone Blvd., which runs along the project boundary for about 860' and ends at a stop light at Bullard Avenue. Another option for site access would be to extend Palm Valley Boulevard 900' to the south. This would require the city to acquire new right-of-way, but would in turn provide a direct link to the stop light at McDowell Rd.

The site has pedestrian/trail access to potential future trail connections at the east and west ends; there is also a possible access point at the UPRR underpass under the I-10 freeway. A proposed pedestrian bridge over Litchfield Rd. can provide a link between the east and west sports complexes and to Litchfield Rd. The ramps up to the pedestrian bridge will be ADA accessible with a minimum 5'x5' landing every 30" of rise.

3.3 Parking & Circulation

Parking lots are generally located along the north property line (closer to McDowell Road) and take advantage of the existing elevated grades. Parking lots also loop around the soccer fields to allow for better parking distribution around the site, and for separation of the soccer fields from the drainage areas. The parking lots accommodate fire truck access and avoid dead end turnarounds.

The west sports complex has six (6) soccer fields and forty-eight (48) pickleball courts that will require 795 parking stalls. The site plan provides 950 parking stalls.

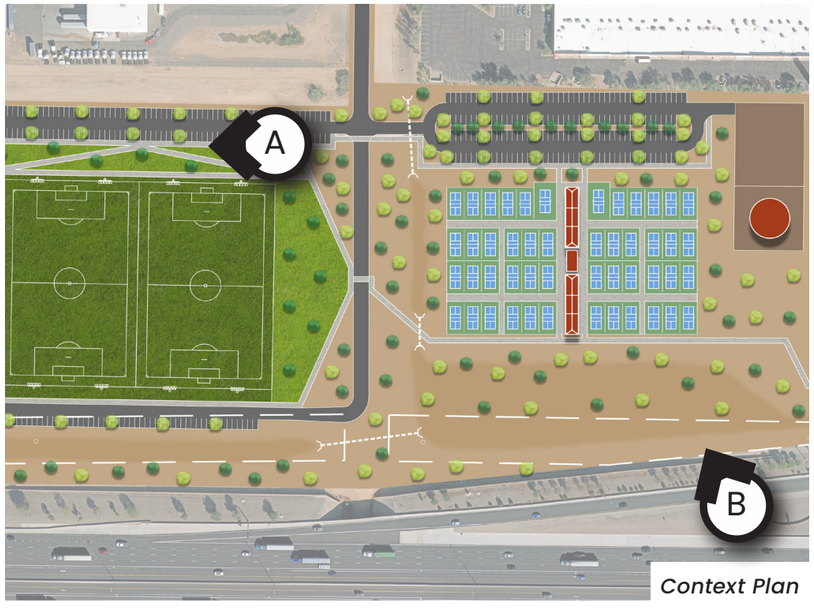
The east sports complex has ten (10) soccer fields that will require 1,000 parking stalls. The site plan provides 1,093 parking stalls.

Both sports complexes will contain multiple concrete pathways for pedestrian circulation around the site. All pathways will be ADA accessible, and pathways from the parking lots to the soccer fields will be benched into the 6:1 slopes. Most pathways will have a maximum of 4.5% longitudinal slope; however, 8.33% is permitted with handrails and landings.

For more information, please see Project Assumptions for a detailed breakdown of required numbers and sizes of parking stalls.



Rendering A



Context Plan



Rendering B

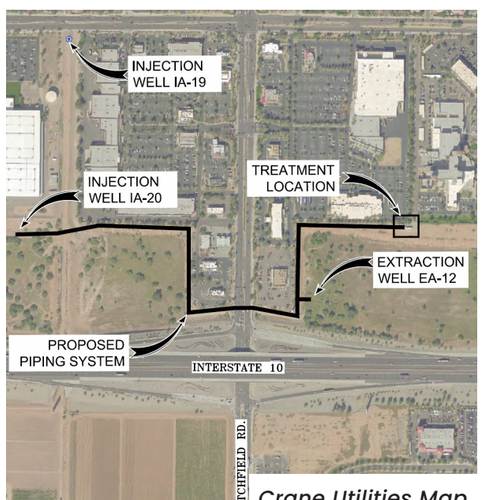
3.4 Wet Utilities

The project site wet utilities include sewer, potable water, reclaimed water, and Crane Utilities water infrastructure. The west sports complex falls within both the city of Goodyear and Liberty Utilities service area. The dividing line is along the west edge of the UPRR property and our understanding is that city or Liberty maintained water lines and water meters need to remain within the service area; however, once beyond the meter, the water can cross the service line. The east sports complex is entirely within the Liberty Utilities serive area.

On the west sports complex, city of Goodyear will provide potable water and sewer service to the Restroom/ Office Building off 145th Avenue. Liberty will provide potable water service to the Small Restroom Building and the Maintenance Yard by installing new lines along the UPRR property. On the east sports complex, Liberty will provide all water and sewer service to the Small Restroom Building and the Maintenance Yard from Cornerstone Blvd., or by extending lines down the possible Palm Valley Blvd right-of-way extension.

The intent is for Liberty water to provide reclaimed water to both the east and west sports complex irrigation storage and pump yards by extending new service lines from McDowell Road via the UPRR property and the Palm Valley Blvd right-of-way extension.

Crane Utilities has existing yards, equipment, and lines on both the east and west sports complexes. The intent is to protect all of the Crane Utilities pipes and equipment in place. If needed, specific lines and equipment may be relocated with the approval from Crane Utilities, but the extraction and injection wells will not be easy to relocate and should remain in place (*see Figures 16A & 16B*).



Crane Utilities Map



Existing Crane Treatment Yard

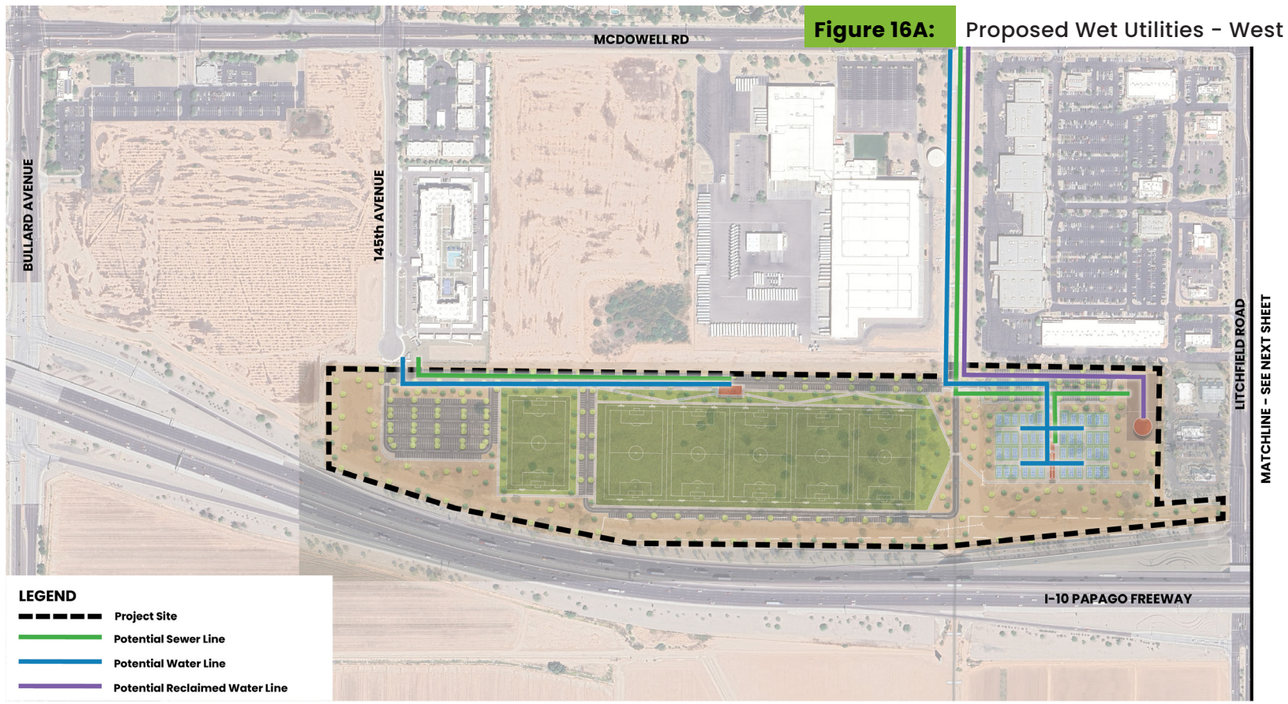


Figure 16A: Proposed Wet Utilities - West

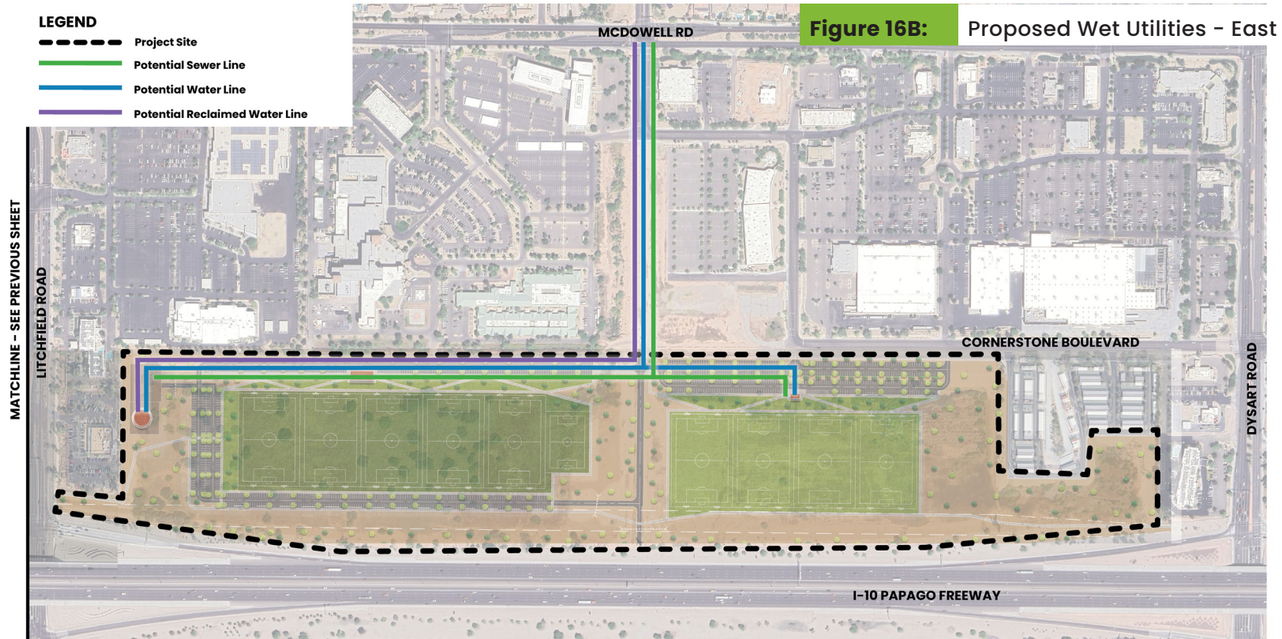


Figure 16B: Proposed Wet Utilities - East

3.5 Irrigation Supply & Distribution

Understanding the type and source of the irrigation water being supplied to the Goodyear Sports Complex is critical to the success of the project. The sports complex must be able to secure a constant, reliable water source that can accommodate the volume required to maintain healthy sports fields during the hottest and driest months of the year. These are crucial considerations as water availability issues have become more prevalent with recent drought conditions in the southwest.

The new 5th Active Management Area Plan (AMA), taking full effect in January 2025, will reduce the allotment of groundwater to be used in the landscape, and regulate how much water-intensive landscape can be designed and installed on a site. The goal of the AMA is to reduce the amount of water-intensive landscape watered by groundwater to 20% of the total site area. Each municipality should confirm with its water management team that any design meets the current AMA guidelines.

Large parks and turf facilities, like the sports complex, will now be limited to a 4.43 acre-foot per acre per year allotment of groundwater for turf areas. Schools or parks, like the future sports complex, can apply for a waiver from the State of Arizona that would increase their overall allotment to a 4.75 acre-foot per acre per year allowance.

However, if only reclaimed water is used, then there are no site design restrictions on how much water-intensive landscape area can be installed. The allowable allotment remains the same but when reporting the usage of reclaimed water, one acre-foot of reclaimed water is only counted as 0.6 acre-foot of water. This is known within the AMA as the 'Effluent Incentive'.

The Goodyear Sports Complex has access to three potential water sources for irrigation. These sources include reclaimed water from Liberty Utilities, TCE-treated water from Crane Utilities, and potable water from either Liberty Utilities or the city of Goodyear. Of these possible choices, potable water is the least desirable water source as it is expensive and has the most restrictions for use.

Reclaimed water from Liberty Utilities has some key benefits. It would be fairly easy to provide a water connection to the site as there is an existing 12" reclaimed water pipe close to the site in McDowell Road. This reclaimed system appears to have enough reclaimed water to supply the required irrigation demand for the soccer complex. Utilizing this source as the only irrigation water source meets AMA requirements and allows for fewer design restrictions on water-intensive landscapes. It also allows for the site to qualify for the 'Effluent Incentive' from the AMA which allows for more irrigation water to be used on the site. The city will have to negotiate with Liberty Utilities to ensure they can deliver the water needed for the sports complex.

Treated TCE water from Crane Utilities may be an option in the future, but further discussions with the company would be required to determine how much water could be made available to the sports complex. The advantage of Crane Utilities' water is that the wells and pumps are already existing on-site; reducing the need for new infrastructure. At this time, however, we do not know how this water is classified under the new AMA guidelines, the quality of the Crane water, or how it could affect the landscape material. This could be a good secondary or supplemental source for the site.

Using reclaimed water from Liberty Utilities through the 'Effluent Incentive' is the best way to provide enough water for the high-quality turf grass needed for championship-caliber sand-based soccer fields.

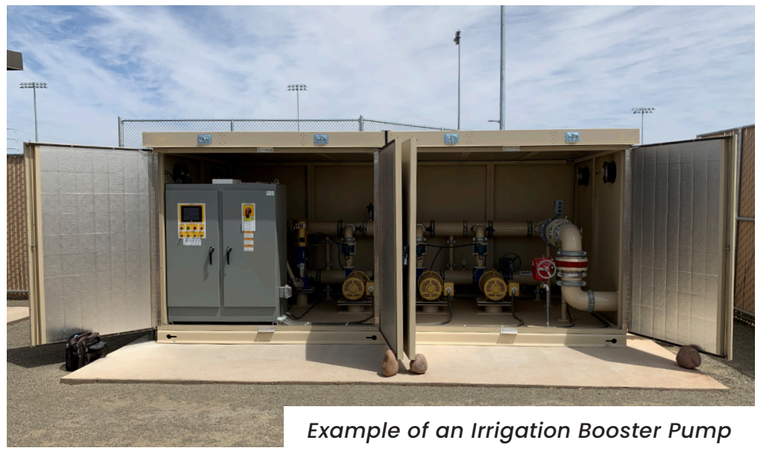
Another challenge to overcome for irrigation is gaining access to McDowell Road. Both the east and west sports complexes will require land acquisition through the UPRR property or new right-of-way along the Palm Valley alignment to get reclaimed water to the site.

Once the water is on-site, it will be stored in two large, above-ground storage tanks with the capacity to hold a minimum of two irrigation cycles during peak seasonal requirements. This allows for two days of on-site storage if the water source to the tanks were ever shut down for maintenance or a pipe break or leak.

These storage tanks are proposed to be approximately 40'-0" high and constructed of flat panel bolted steel. There is opportunity to add murals or other graphic enhancements to the tanks for community enrichment. Retaining walls could be utilized to keep the bottom of the tanks at the existing grade to minimize the visual impact on the surrounding developments. An 8' high CMU security wall would surround the tank to separate them from the public.

The West Complex tank will be sized to hold approximately 800,000 gallons and the East Complex tank will hold approximately 1.1 million gallons.

Each irrigation water tank will be connected to a large irrigation booster pump station that will provide the park with enough flow and pressure to distribute water efficiently by providing uniform coverage across the site. Both the west and east complexes will utilize their own booster pump station sized to meet a water window at peak seasonal demand.



Example of an Irrigation Booster Pump



Example of a Water Storage Tank

To water the park within a water window of five days per week at 7 hours per day, the west complex will require approximately 860 GPM at 110 PSI and the east complex will require approximately 1,250 GPM at 110 PSI (*see Figures 17A & 17B*).

The Goodyear Sports Complex will utilize the new smart-irrigation controllers that have the latest technology including:

- 2-wire with decoders that cut down wire runs and help self-diagnose the irrigation system
- Capability to communicate with the booster pump via the pump start relay
- Capability to communicate with a central control system
- Capability to read flow and shut down master valve in the event of a mainline break
- Remote notifying and remote control from the system

See Appendix for a detail breakdown of Annual Water Demand and Peak Daily Demand

Figure 17A: Estimated Water Demand - West

city of Goodyear

Sports Complex Feasibility Study (West Site)

Estimated Irrigation Water Demand Summary Sheet

Prepared By: J2 Design

5/21/2024

Landscape Quantitites			
Landscapable Area (SqFt)	2,530,000	Trees	750
Park Turf Area (SqFt)	144,320	Shrubs	1,350
Sports Turf Area (SqFt)	679,900	Groundcovers / Cactus	600

Water Demand	Gallons Per Year	Peak Daily Gallons Per Minute	Acre/Ft per Acre
Turf Water Demand- Park Turf	5,489,966	131	5.1
Turf Water Demand- Sports Turf	27,853,058	666	5.5
Plants Water Demand- Drip	2,468,617	55	0.1
Total Estimated Irrigation Water Demand:	**35,811,641 GPY**	**852 GPM**	**109.90 AFPY**

Notes:

1. The water use calculations assume that there will be no winter overseed turf. The calculations include a single turf irrigation scheduled weekly to maintain the turf and soil health during the cool season (Nov 1 through March 31).
2. Actual water demands will vary depending on level of turf and plant quality, climate conditions, rainfall, and controller program settings.
3. Average annual water demands do not include any contingencies and peak daily water demands do include contingencies- see calculations.

AFPY = Acre Feet Per Year

GPY = Gallons Per Year

GPM = Gallons Per Minute

Figure 17B: Estimated Water Demand - East

city of Goodyear

Sports Complex Feasibility Study (East Site)

Estimated Irrigation Water Demand Summary Sheet

Prepared By: J2 Design

5/21/2024

Landscape Quantitites			
Landscapable Area (SqFt)	3,415,000	Trees	750
Park Turf Area (SqFt)	618,810	Shrubs	1,350
Sports Turf Area (SqFt)	632,100	Groundcovers / Cactus	600

Water Demand	Gallons Per Year	Peak Daily Gallons Per Minute	Acre/Ft per Acre
Turf Water Demand- Park Turf	23,539,676	563	5.1
Turf Water Demand- Sports Turf	25,894,864	619	5.5
Plants Water Demand- Drip	2,468,617	55	0.1
Total Estimated Irrigation Water Demand:	**51,903,156 GPY**	**1,236 GPM**	**159.28 AFPY**

Notes:

1. The water use calculations assume that there will be no winter overseed turf. The calculations include a single turf irrigation scheduled weekly to maintain the turf and soil health during the cool season (Nov 1 through March 31).
2. Actual water demands will vary depending on level of turf and plant quality, climate conditions, rainfall, and controller program settings.
3. Average annual water demands do not include any contingencies and peak daily water demands do include contingencies- see calculations.

AFPY = Acre Feet Per Year

GPY = Gallons Per Year

GPM = Gallons Per Minute

3.6 Electrical Power

While researching the existing utility equipment around this project site, Wright Engineering Corporation communicated with Kevin Balchik at Arizona Public Service (APS). Mr. Balchik provided information from APS power service location maps and used APS estimating tools to aid in the research of the information in this memo.

The APS power feeds may be provided from nearby existing APS distribution lines. This will require the addition of new switching cabinets and transformers to bring power to the new electrical service entrance section (SES) locations. It may also be possible to upgrade existing nearby switch cabinets and transformers to provide power to new SES locations (*see Figures 19A & 19B*).

This site will require three (3) new metered electrical services: one (1) 2,000 amp, 480 volt, three-phase service for the eastern portion of the park; one (1) 2,500 amp, 480 volt, three-phase service for the western portion of the park; and one (1) 1,200 amp, 480 volt, three-phase service for the community center building (*see Figure 18*).

To establish the new SES locations on the site, the following equipment is needed:

- Modifications to existing APS switch cabinet(s)
- Modifications to existing APS transformer(s)
- Addition of new APS switch cabinet(s)
- Addition of new APS transformer(s)
- APS primary feeders (concrete encased conduit and conductors) extended from new APS switching cabinet(s) to new APS transformer(s) installed on a concrete pad,
- New APS primary feeders (concrete encased conduit and conductors) extended from existing/upgraded APS switching cabinet(s) to existing/upgraded APS transformer(s),
- New secondary feeders extended from transformer(s) to new SES locations.

(See Figures 19A & 19B for preferred SES panel locations.)

Figure 18: Proposed SES Load Summary

Sports Area East

SES	Description	Power (watts)	Amps at 480V	Quantity	Total Amps at 480V	
1	Soccer Field	75000	90.3	6	541.9	
1	Receptacle	960	1.2	18	20.8	
1	Parking Lot	150	0.2	220	39.7	
1	Pathway	150	0.2	215	38.8	
1	Maintenance Building	83000	100.0	1	100.0	
1	Maintenance Yard	50000	60.2	1	60.2	
1	Booster Pump Equipment	266046	320.4	1	320.4	
					1121.8	**Total amps for SES**
					1402.3	**SES Size with Derate (amps)**
					2000.0	**Actual Size of SES (amps)**

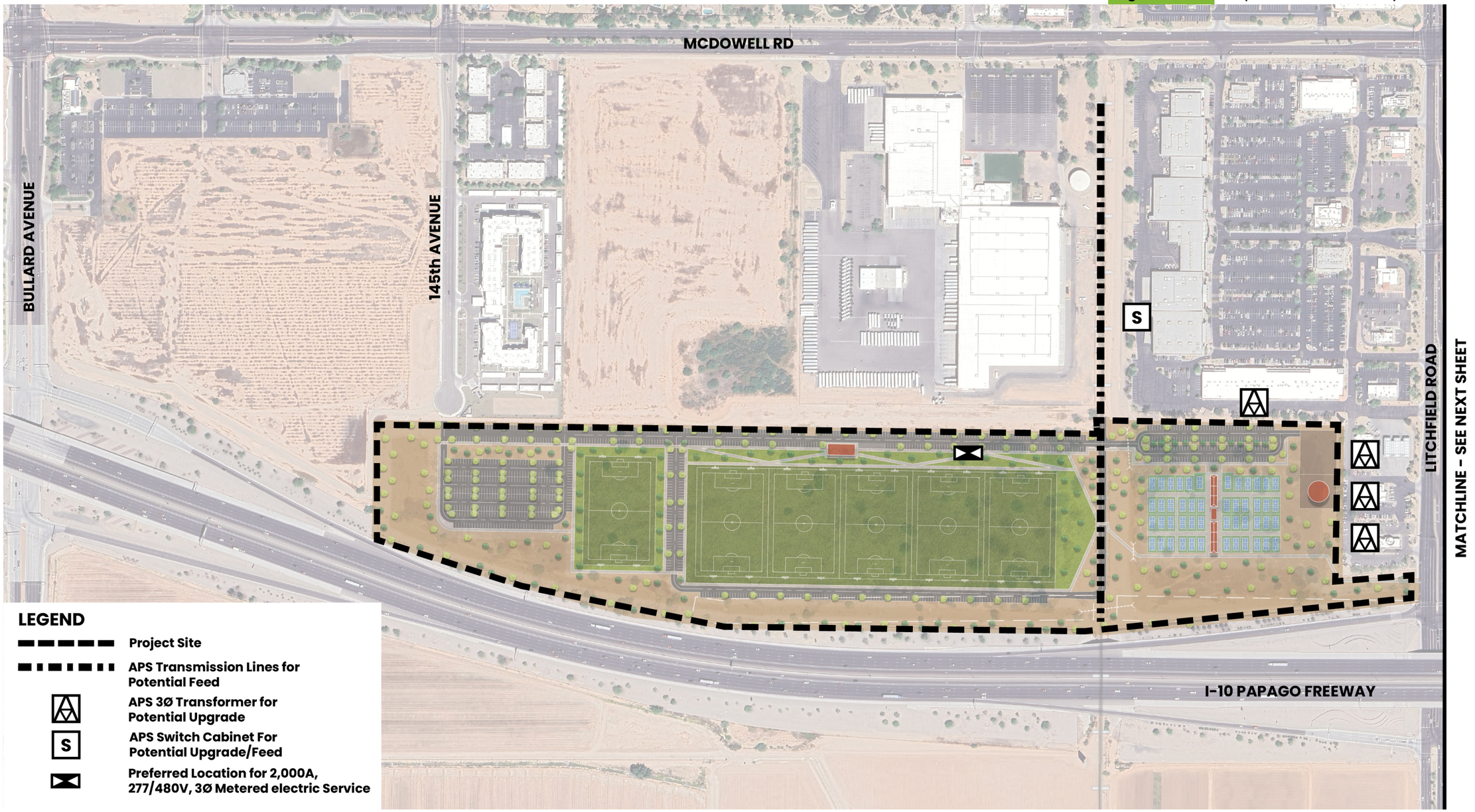
Sports Area West

SES	Description	Power (watts)	Amps at 480V	Quantity	Total Amps at 480V	
2	Soccer Field	75000	90.3	9	812.9	
2	Pickleball Court	3000	3.6	48	173.4	
2	Ramada	200	0.2	4	1.0	
2	Receptacle West	960	1.2	20	23.1	
2	Parking Lot West	150	0.2	220	39.7	
2	Pathway West	150	0.2	215	38.8	
2	Maintenance Building West	83000	100.0	1	100.0	
2	Maintenance Yard West	50000	60.2	1	60.2	
2	Booster Pump Equipment	266046	320.4	1	320.4	
					1569.5	**Total amps for SES**
					1961.8	**SES Size with Derate (amps)**
					2500.0	**Actual Size of SES (amps)**

3.7 Future APS Easement & Poles

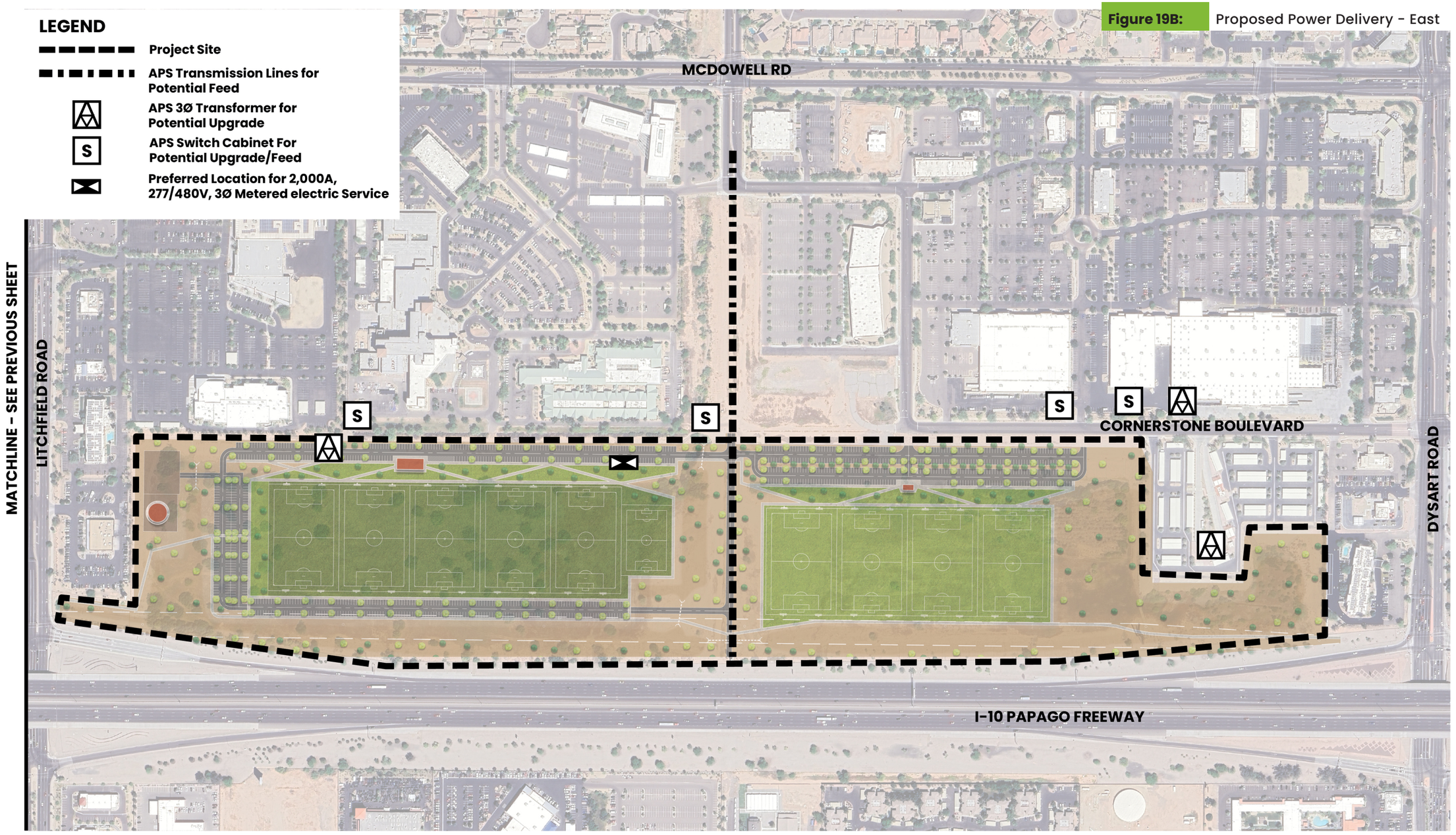
APS is currently designing the Three Rivers Sub/Compass Phase 3 (230kV) transmission line project. The Three Rivers project runs east to west, across the south side of the Goodyear Sports Complex paralleling due north of the I-10. The 130' tall power poles and power lines will be located within a ninety (90) foot wide easement. Allowed uses within the easement are currently being negotiated between the city of Goodyear and APS.

Figure 19A: Proposed Power Delivery - West



Proposed Power Delivery Source Locations - West

Figure 19B: Proposed Power Delivery - East



Proposed Power Delivery Source Locations - East

3.8 Landscape Character

Comfort, sustainability, and function are the main factors guiding the landscape design and layout of Goodyear Sports Complex.

In efforts to reduce water consumption on site, natural turf is used as sparingly as possible. Soccer fields contained within pedestrian routes limit the amount of turf while providing ideal circulation closer to fields for accessibility. Proposing turf in areas where there is grade change from the parking lot to the fields creates an excellent opportunity for prime viewing areas of the sporting events and practices occurring below.

The plant palette used on site will be selected from ADWR's "Low Water Use Drought Tolerant Plant List", with the exception of plant material which falls within the transmission line easement running across the southern portion of the site. Plants within this easement are to follow size requirements by APS. Reducing costs associated with maintenance is a guiding factor. Only low-maintenance understory plant material will be used in amenitized areas in efforts to soften the spaces and provide higher aesthetics in higher traffic areas.

Native seed is an option which may be utilized to increase pollinator habitat and ensure the landscape on site incorporates principles which promote environmental sustainability of the region's local flora and fauna. Areas of native seed may be considered in the southern portion of the site (with respect to the APS Easement) and on the slopes of drainage areas and basins for erosion control. These areas act as revegetation areas over time, and mimic the surrounding natural desert landscape, requiring little to no maintenance once established.

Larger, park-style canopy trees will be planted along paths to create shaded walkways. These large single-trunk trees will also be used in viewing areas within natural turf, providing comfortable seating areas to spread a blanket or park a folding chair under the canopies during the summer. In the winter, these deciduous trees will drop their leaves and allow the public to enjoy the sunshine during cooler months. In efforts to promote biodiversity on site and utilize more native plant material, multi-trunk desert trees will be utilized in larger open space areas to provide habitat on site for native wildlife and migratory birds. *(See Figure 20)*

Other than sports fields, courts, and parking areas, the majority of the site is proposed to be planting and drainage areas, with a top dress of angular rock or decomposed granite (D.G.) in a color which will complement the proposed plant material and site aesthetics. The size of the D.G. is dependent on its function, with granite in tree and understory planting areas (1/2" -2"), and larger granite or "Rip Rap" (4"-12") to be used on sloped or drainage areas for stabilization and erosion control. Decomposed granite will also aid in dust control and help prevent moisture loss.

The Goodyear Sports Complex creates opportunities for multiple types of recreation and physical activity, promoting health and wellness of the local community and visitors. Layout of the site and creating accessible routes in close proximity to amenities and restrooms was crucial to a successful design. Each of the east and west complexes includes a maintenance yard, storage tank and irrigation pump yard, and restroom building with offices. Dispersing program elements across the site helps ensure visitors do not need to walk far to access amenities, and also helps prevent pedestrian and vehicular congestion.

A pedestrian trail connects the east and west complexes on the southern portion of the site. This amenity will not only provide a necessary pedestrian route throughout the site, but also creates a new physical recreation element for the public's use. Distance markers may help users track users' progress and promote use of the trail. The trail begins at the eastern complex's training center at N 145th Avenue, moves east wrapping on the south side of the sports fields and parking lots, crossing Litchfield road via pedestrian bridge, and finally connecting to Bullard Avenue to the east.



Conceptual Rendering - Shade Trees



Conceptual Rendering - Soccer Fields

Figure 20: Plant Image Board

TREES



Acacia aneura
Mulga



Acacia stenophylla
Shoestring Acacia



Acacia willardiana
Palo Blanco



Celtis reticulata
Canyon Hackberry



Chilopsis linearis
Desert Willow



Dalbergia sissoo
Indian Rosewood



Eucalyptus spp.
Eucalyptus varieties



Parkinsonia spp.
Palo Verde varieties



Pistacia chinensis
Chinese Pistache

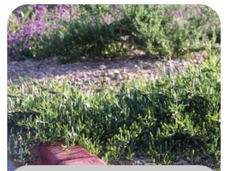


Prosopis spp.
Mesquite varieties



Ulmus parvifolia
Evergreen Elm

SHRUBS



Acacia redolens
Desert Carpet



Baileya multiradiata
Common name



Bougainvillea spp.
Bougainvillea



Bouteloua gracilis
Blue Grama Grass



Caesalpinia spp.
Bird-of-Paradise



Calliandra californica
Baja Fairy Duster



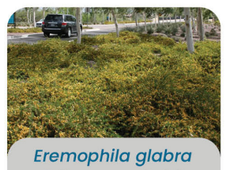
Convolvulus cnemorum
Bush Morning Glory



Cordia parvifolia
Little-leaf Cordia



Dodonea viscosa
Hopseed Bush



Eremophila glabra 'Mingenew Gold'
Outback Sunrise Emu



Eremophila maculata
Red Emu Bush



Justicia californica
Chuparosa



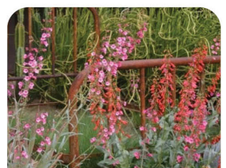
Lantana spp.
Lantana



Leucophyllum spp
Sage varieties



Muhlenbergia rigens
Deer Grass



Penstemon spp.
Penstemon varieties



Psilostrophe cooperi
Paper Flower



Ruellia spp.
Ruellia varieties



Senna phyllodinea
Silver-leaf Cassia



Senna wislizenii
Shrubby Cassia



Sphaeralcea ambigua
Globe Mallow



Tecoma spp.
Tecoma varieties



Zinnia grandiflora
Prairie Zinnia

ACCENTS



Agave desmettiana
Smooth Agave



Aloe barbadensis
Medicinal Aloe



Asclepias subulata
Desert Milkweed



Carnegiea gigantea
Saguaro



Ferrocactus wislizenii
Fishhook Barrel Cactus



Opuntia ficus-indica
Indian Fig

Opuntia robusta
Giant Prickly Pear

Pachycereus marginatus
Mexican Fence Post

Euphorbia antisyphilitica
Candelilla

Fouqueria splendens
Ocotillo

Hesperaloe spp.
Hesperaloe varieties

3.9 Project Assumptions

The following assumptions were used to develop the Preferred Alternative site plan:

Parking Requirements:

- Parking Stall- 10’ x 20’
- Parking Lot Drive Aisle- 24’ wide
- Fire Truck Turning Radius- 35’ minimum
- Soccer Fields= 100 cars / Field
- Pickleball Courts= 2 cars / Court

Grading Assumptions:

- Parking Lots = 1.5% slope max.
- Parking Lot drives= 5%-6%; 8% max
- Pathways= 0-4.5%; 8.33% max with handrails
- Soccer Field= Flat, crowned to sides
- Pickleball= 0.5% slope
- Turf Slopes= 6:1 max
- DG slopes= 4:1 max
- Sections have a 5:1 vertical exaggeration

Irrigation Assumptions:

- 2 days of irrigation stored in tanks
- Sand Based Fields- 5 day- 7 hour water window, Crop Coefficient 0.70, DU 0.70
- Native Based Fields- 8 day- 7 hour water window, Crop Coefficient 0.65, DU 0.70

Property Acquisitions:

- UPRR Property- 2.37 acres
- Palm Valley Blvd- 1.13 acres



Conceptual Rendering - Pathways to Fields



Conceptual Rendering -Overview of Fields



Conceptual Rendering - Pathways to Fields



Conceptual Rendering - Pickleball Courts

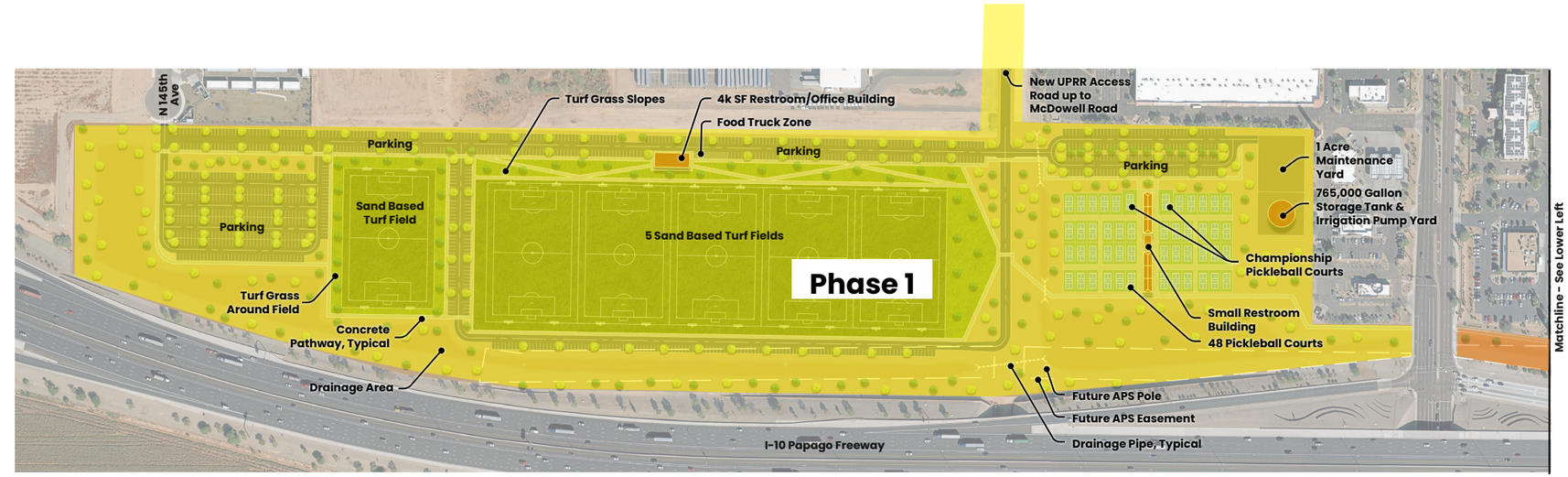


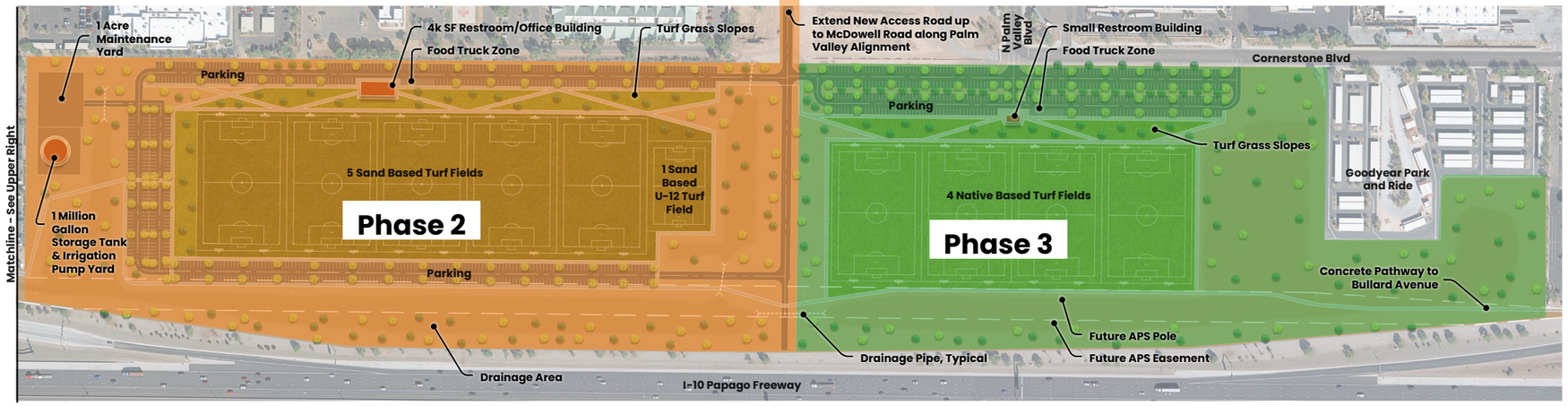
Conceptual Rendering - Pathways to Fields

Part Four

Project Phasing & Costs

4.0 PROJECT PHASING & COSTS





The Phasing Plan and Phase Opinions of Probable Cost set priorities and outline budget limitations within a practical and logical framework. By serving as a comprehensive planning tool, the phasing plan enables the city of Goodyear to systematically advance the sports complex to its maximum capacity.

Phase 1: Utilities, roadway connection to McDowell Road, maintenance yard, water storage tank and pump yard, six sand based championship sized soccer fields, restroom and office building, forty-eight pickleball courts and small restroom, parking

Phase 2: Utilities, roadway connection to McDowell Road, maintenance yard, water storage tank and pump yard, five sand based championship sized soccer fields, one sand based U-12 field, restroom and office building, parking

Phase 3: Utilities, four native based championship sized soccer fields, small restroom building, parking

Phase	Construction Cost
Phase 1	$64,936,073
Phase 2	$43,401,847
Phase 3	$21,737,877
Total	**$130,075,797**

Figure 21: Opinion of Probable Cost - All Phases

Goodyear Sports Complex-Preferred Alterantive - All Phases

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Grading & Utilities				
1	Site Clearing & Demolition	AC	139	$ 3,500.00	$ 487,900.00
2	Mass Grading	CY	592,229	$ 4.25	$ 2,516,973.25
3	Fill Import Material	CY	409,287	$ 18.00	$ 7,367,166.00
4	On-site Drainage Infrastructure (Misc. headwalls, railing, pipe, scuppers)	LS	1	$ 200,000.00	$ 200,000.00
5	48" Drain Pipe	LF	270	$ 550.00	$ 148,500.00
6	84" Drain Pipe	LF	190	$ 1,000.00	$ 190,000.00
7	Three 8' x8' Box Culvert	LF	170	$ 2,200.00	$ 374,000.00
8	Four 8' x8' Box Culvert	LF	205	$ 2,900.00	$ 594,500.00
9	2" Water Line & Extensions	LF	8,517	$ 85.00	$ 723,945.00
10	2" Water Meters & Backflow Preventers including Impact Fees	EA	6	$ 50,000.00	$ 300,000.00
11	Quick Coupler with Valve	EA	6	$ 600.00	$ 3,600.00
12	Fire Hydrants	EA	27	$ 16,000.00	$ 432,000.00
13	6" Sewer Service & Extension	LF	5,283	$ 145.00	$ 766,035.00
14	8" Reclaimed Water Line	LF	6,095	$ 135.00	$ 822,825.00
	Grading & Utilities Sub-Total				**$ 14,927,444.25**
	Paving, Striping, and Sidewalks				
15	Park Roadway Paving & Striping	SY	54,968	$ 65.00	$ 3,572,920.00
16	Parking Lot Paving & Striping	SY	47,616	$ 60.00	$ 2,856,960.00
17	Curb & Gutter for Parking Lots and Park Road	LF	39,253	$ 35.00	$ 1,373,855.00
18	6" Concrete Sidewalk w/ ABC subgrade	SF	339,883	$ 17.00	$ 5,778,011.00
	Paving & Striping Sub-Total				**$ 13,581,746.00**
	Irrigation Water Storage & Pump Yard				
19	775 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (West)	LS	1	$ 650,000.00	$ 650,000.00
20	1,270 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (East)	LS	1	$ 715,000.00	$ 715,000.00
21	765,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (West)	LS	1	$ 1,645,000.00	$ 1,645,000.00
22	1,000,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (East)	EA	1	$ 1,800,000.00	$ 1,800,000.00
	Water Storage Sub-Total				**$ 4,810,000.00**
	Sports Fields & Courts				
23	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Native), and Irrigation	EA	4	$ 600,000.00	$ 2,400,000.00
24	U012 Soccer Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	1	$ 300,000.00	$ 300,000.00
25	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	11	$ 600,000.00	$ 6,600,000.00
26	Pickleball Courts (post-tension)	EA	48	$ 62,000.00	$ 2,976,000.00
	Sports Fields & Courts Sub-Total				**$ 12,276,000.00**
	Recreation Amenities				
27	Chilled Drinking Fountains	EA	9	$ 16,000.00	$ 144,000.00
28	Site Furnishings (Benches, Litter Receptacles, Pet Waste Stations, Removable Bollards, Entry Gates, BBQ's)	LS	1	$ 115,000.00	$ 115,000.00
29	Entry Monuments (East & West)	EA	2	$ 35,000.00	$ 70,000.00
30	Ball Protection Fence (12' Height)	LF	3,965	$ 280.00	$ 1,110,200.00
30	36" CMU Parking Screen Wall	LF	560	$ 100.00	$ 56,000.00
31	Concrete Retaining Wall- Avg 30" High	LF	600	$ 350.00	$ 210,000.00
32	Wayfinding Signage	LS	1	$ 101,000.00	$ 101,000.00
	Recreation Amenitites Sub-Total				**$ 1,806,200.00**
	General Park Landscape & Irrigation				
33	General Park Landscape & DG (not counting ballfields or multi-use fields)	SF	2,448,568	$ 3.00	$ 7,345,704.00
34	General Park Turf Grass (hydro-sprigged) (not counting ballfields or multi-use fields)	SF	294,910	$ 1.50	$ 442,365.00
35	General Park Drip Irrigation (not counting multi-use fields)	SF	2,448,568	$ 1.35	$ 3,305,566.80
36	General Park Turf Irrigation (not counting multi-use fields)	SF	294,910	$ 2.00	$ 589,820.00
37	Irrigation Control System & Two Wire Path	EA	2	$ 50,000.00	$ 100,000.00
	General Park Landscape & Irrigation Sub-Total				**$ 11,783,455.80**
	Architecture / Ramadas				
38	Restroom & Office Building 100' x 40'	EA	2	$ 2,000,000.00	$ 4,000,000.00
39	Restroom Building 20' x 40'	EA	2	$ 1,500,000.00	$ 3,000,000.00
40	20' x 40' Pickleball Shade Structures w/ Seating and Paving	EA	6	$ 90,000.00	$ 540,000.00
41	One Acre Maintenance Yard w/ Office and Shaded Service Bays	EA	2	$ 1,500,000.00	$ 3,000,000.00
	Architecture Sub-Total				**$ 10,540,000.00**
	Electrical & Lighting				
42	Site Electrical Service Entrance Section and Lighting Control Equipment, Primary and Secondary Power Conduits, Transformer Pad	LS	1	$ 340,000.00	$ 340,000.00
43	APS Fees	LS	1	$ 100,000.00	$ 100,000.00
44	Lighted Multi-Use Fields	EA	15	$ 300,000.00	$ 4,500,000.00
45	Pickleball Courts	EA	48	$ 12,500.00	$ 600,000.00
46	Maintenance Building Power and Lighting	EA	2	$ 80,000.00	$ 160,000.00
47	Restroom Lighting and Power Feed	EA	2	$ 30,000.00	$ 60,000.00
48	Restroom & Office Building Lighting and Power Feed	EA	2	$ 100,000.00	$ 200,000.00
49	Pickleball Shade Structure Lighting and Power	EA	2	$ 18,000.00	$ 36,000.00
50	Site and Pathway Lighting	LS	1	$ 3,315,000.00	$ 3,315,000.00
51	All Parking Lot and Drive Lighting	LS	1	$ 2,715,000.00	$ 2,715,000.00
52	Irrigation Booster Pump Station Power Feed	EA	2	$ 75,000.00	$ 150,000.00
53	Storage Tank Fill Pump Power Feed	EA	2	$ 75,000.00	$ 150,000.00
54	Site Electrical (receptacles, power to gates, chilled drinking fountain, etc)	LS	1	$ 800,000.00	$ 800,000.00
	Electrical & Lighting Sub-Total				**$ 13,126,000.00**

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Land Acquisition				
55	UPRR Property Acquisition	LS	1	N/A	
56	Palm Valley Blvd Right-of-Way Acquitision	LS	1	N/A	
	Project Construction Sub-Total				$ 82,850,846.05
	Construction Stakes, Lines and Grades and Asbuilts	LS	1	$ 1,657,000.00	$ 1,657,000.00
	Storm Water Pollution Prevention Plan, Maintenance and Permits	LS	1	$ 828,500.00	$ 828,500.00
	Project Contingency (30%)	AL	1	$ 24,855,250.00	$ 24,855,250.00
	Final Design/Engineering (8%)	AL	1	$ 6,628,050.00	$ 6,628,050.00
	Mobilization/Demobilization	LS	1	$ 4,971,050.00	$ 4,971,050.00
	Insurance/Taxes/Bond/GCs, etc	LS	1	$ 8,285,100.00	$ 8,285,100.00
	Project Construction Grand Total				**$ 130,075,796.05**

Figure 22: Opinion of Probable Cost - Phase 1

Goodyear Sports Complex-Preferred Alterantive - Phase 1 West Fields & Pickleball

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Grading & Utilities				
1	Site Clearing & Demolition	AC	58	$ 3,500.00	$ 204,400.00
2	Mass Grading	CY	297,159	$ 4.25	$ 1,262,925.75
3	Fill Import Material	CY	290,723	$ 18.00	$ 5,233,014.00
4	On-site Drainage Infrastructure (Misc. headwalls, railing, pipe, scuppers)	LS	1	$ 75,000.00	$ 75,000.00
5	48" Drain Pipe	LF	180	$ 550.00	$ 99,000.00
6	84" Drain Pipe	LF	0	$ 1,000.00	$ -
7	Three 8' x8' Box Culvert	LF	0	$ 2,200.00	$ -
8	Four 8' x8' Box Culvert	LF	205	$ 2,900.00	$ 594,500.00
9	2" Water Line & Extensions	LF	4,210	$ 85.00	$ 357,850.00
10	2" Water Meters & Backflow Preventers including Impact Fees	EA	3	$ 50,000.00	$ 150,000.00
11	Quick Coupler with Valve	EA	6	$ 600.00	$ 3,600.00
12	Fire Hydrants	LF	14	$ 16,000.00	$ 224,000.00
13	6" Sewer Service & Extension	LF	2,963	$ 145.00	$ 429,635.00
14	8" Reclaimed Water Line	LF	2,395	$ 135.00	$ 323,325.00
	Grading & Utilities Sub-Total				**$ 8,957,249.75**
	Paving, Striping, and Sidewalks				
15	Park Roadway Paving & Striping	SY	27,740	$ 65.00	$ 1,803,100.00
16	Parking Lot Paving & Striping	SY	22,755	$ 60.00	$ 1,365,300.00
17	Curb & Gutter for Parking Lots and Park Road	LF	20,918	$ 35.00	$ 732,130.00
18	6" Concrete Sidewalk w/ ABC subgrade	SF	153,035	$ 17.00	$ 2,601,595.00
	Paving & Striping Sub-Total				**$ 6,502,125.00**
	Irrigation Water Storage & Pump Yard				
19	775 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (West)	LS	1	$ 650,000.00	$ 650,000.00
20	1,270 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (East)	LS	0	$ -	$ -
21	765,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (West)	EA	1	$ 1,645,000.00	$ 1,645,000.00
22	1,000,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (East)	EA	0	$ 1,800,000.00	$ -
	Water Storage Sub-Total				**$ 2,295,000.00**
	Sports Fields & Courts				
23	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Native), and Irrigation	EA	0	$ 600,000.00	$ -
24	U-12 Soccer Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	0	$ 300,000.00	$ -
25	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	6	$ 600,000.00	$ 3,600,000.00
26	Pickleball Courts (post-tension)	EA	48	$ 62,000.00	$ 2,976,000.00
	Sports Fields & Courts Sub-Total				**$ 6,576,000.00**
	Recreation Amenities				
27	Chilled Drinking Fountains	EA	5	$ 16,000.00	$ 80,000.00
28	Site Furnishings (Benches, Litter Receptacles, Pet Waste Stations, Removable Bollards, Entry Gates, BBQ's)	LS	1	$ 50,000.00	$ 50,000.00
29	Entry Monuments (East & West)	EA	1	$ 35,000.00	$ 35,000.00
30	Ball Protection Fence (12' Height)	LF	1,585	$ 280.00	$ 443,800.00
30	36" CMU Parking Screen Wall	LF	0	$ 100.00	$ -
31	Concrete Retaining Wall- Avg 30" High	LF	300	$ 350.00	$ 105,000.00
32	Wayfinding Signage	LS	1	$ 38,000.00	$ 38,000.00
	Recreation Amenitites Sub-Total				**$ 751,800.00**
	General Park Landscape & Irrigation				
33	General Park Landscape & DG (not counting ballfields or multi-use fields)	SF	912,018	$ 3.00	$ 2,736,054.00
34	General Park Turf Grass (hydro-sprigged) (not counting ballfields or multi-use fields)	SF	144,320	$ 1.50	$ 216,480.00
35	General Park Drip Irrigation (not counting multi-use fields)	SF	912,018	$ 1.35	$ 1,231,224.30
36	General Park Turf Irrigation (not counting multi-use fields)	SF	144,320	$ 2.00	$ 288,640.00
37	Irrigation Control System & Two Wire Path	EA	1	$ 50,000.00	$ 50,000.00
	General Park Landscape & Irrigation Sub-Total				**$ 4,522,398.30**
	Architecture / Ramadas				
38	Restroom & Office Building 100' x 40'	EA	1	$ 2,000,000.00	$ 2,000,000.00
39	Restroom Building 20' x 40'	EA	1	$ 1,500,000.00	$ 1,500,000.00
40	20' x 40' Pickleball Shade Structures w/ Seating and Paving	EA	6	$ 90,000.00	$ 540,000.00
41	One Acre Maintenance Yard w/ Office and Shaded Service Bays	EA	1	$ 1,500,000.00	$ 1,500,000.00
	Architecture Sub-Total				**$ 5,540,000.00**

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Electrical & Lighting				
42	Site Electrical Service Entrance Section and Lighting Control Equipment, Primary and Secondary Power Conduits, Transformer Pad	LS	1	$ 170,000.00	$ 170,000.00
43	APS Fees	LS	1	$ 50,000.00	$ 50,000.00
44	Lighted Multi-Use Fields	EA	6	$ 300,000.00	$ 1,800,000.00
45	Pickleball Courts	EA	48	$ 12,500.00	$ 600,000.00
46	Maintenance Building Power and Lighting	LS	1	$ 80,000.00	$ 80,000.00
47	Restroom Lighting and Power Feed	EA	1	$ 30,000.00	$ 30,000.00
48	Restroom & Office Building Lighting and Power Feed	EA	1	$ 100,000.00	$ 100,000.00
49	Pickleball Shade Structure Lighting and Power	EA	2	$ 18,000.00	$ 36,000.00
50	Site and Pathway Lighting	LS	1	$ 1,425,000.00	$ 1,425,000.00
51	All Parking Lot and Drive Lighting	LS	1	$ 1,425,000.00	$ 1,425,000.00
52	Irrigation Booster Pump Station Power Feed	EA	1	$ 75,000.00	$ 75,000.00
53	Storage Tank Fill Pump Power Feed	EA	1	$ 75,000.00	$ 75,000.00
54	Site Electrical (receptacles, power to gates, chilled drinking fountain, etc)	LS	1	$ 350,000.00	$ 350,000.00
	Electrical & Lighting Sub-Total				**$ 6,216,000.00**
	Land Acquisition				
55	UPRR Property Acquisition	LS	1	N/A	
56	Palm Valley Blvd Right-of-Way Acquitision	LS	1	N/A	
	Project Construction Sub-Total				$ 41,360,573.05
	Construction Stakes, Lines and Grades and Asbuilts	LS	1	$ 827,200.00	$ 827,200.00
	Storm Water Pollution Prevention Plan, Maintenance and Permits	LS	1	$ 413,600.00	$ 413,600.00
	Project Contingency (30%)	AL	1	$ 12,408,150.00	$ 12,408,150.00
	Final Design/Engineering (8%)	AL	1	$ 3,308,850.00	$ 3,308,850.00
	Mobilization/Demobilization	LS	1	$ 2,481,650.00	$ 2,481,650.00
	Insurance/Taxes/Bond/GCs, etc	LS	1	$ 4,136,050.00	$ 4,136,050.00
	Project Construction Grand Total				**$ 64,936,073.05**

Figure 23: Opinion of Probable Cost - Phase 2

Goodyear Sports Complex-Preferred Alterantive - Phase 2 East Fields

:4

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Grading & Utilities				
1	Site Clearing & Demolition	AC	46	$ 3,500.00	$ 161,000.00
2	Mass Grading	CY	221,223	$ 4.25	$ 940,197.75
3	Fill Import Material	CY	118,457	$ 18.00	$ 2,132,226.00
4	On-site Drainage Infrastructure (Misc. headwalls, railing, pipe, scuppers)	LS	1	$ 75,000.00	$ 75,000.00
5	48" Drain Pipe	LF	90	$ 550.00	$ 49,500.00
6	84" Drain Pipe	LF	190	$ 1,000.00	$ 190,000.00
7	Three 8' x8' Box Culvert	LF	170	$ 2,200.00	$ 374,000.00
8	Four 8' x8' Box Culvert	LF	0	$ 2,900.00	$ -
9	2" Water Line & Extensions	LF	3,517	$ 85.00	$ 298,945.00
10	2" Water Meters & Backflow Preventers including Impact Fees	EA	2	$ 50,000.00	$ 100,000.00
11	Quick Coupler with Valve	EA	0	$ 600.00	$ -
12	Fire Hydrants	EA	10	$ 16,000.00	$ 160,000.00
13	6" Sewer Service & Extension	LF	2,035	$ 145.00	$ 295,075.00
14	8" Reclaimed Water Line	LF	3,700	$ 135.00	$ 499,500.00
	Grading & Utilities Sub-Total				**$ 5,275,443.75**
	Paving, Striping, and Sidewalks				
15	Park Roadway Paving & Striping	SY	19,518	$ 65.00	$ 1,268,670.00
16	Parking Lot Paving & Striping	SY	15,861	$ 60.00	$ 951,660.00
17	Curb & Gutter for Parking Lots and Park Road	LF	11,215	$ 35.00	$ 392,525.00
18	6" Concrete Sidewalk w/ ABC subgrade	SF	117,462	$ 17.00	$ 1,996,854.00
	Paving & Striping Sub-Total				**$ 4,609,709.00**
	Irrigation Water Storage & Pump Yard				
19	775 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (West)	LS	0	$ 650,000.00	$ -
20	1,270 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (East)	LS	1	$ 715,000.00	$ 715,000.00
21	765,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (West)	LS	0	$ 1,645,000.00	$ -
22	1,000,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (East)	EA	1	$ 1,800,000.00	$ 1,800,000.00
	Water Storage Sub-Total				**$ 2,515,000.00**
	Sports Fields & Courts				
23	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Native), and Irrigation	EA	0	$ 600,000.00	$ -
24	U-12 Soccer Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	1	$ 300,000.00	$ 300,000.00
25	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	5	$ 600,000.00	$ 3,000,000.00
26	Pickleball Courts (post-tension)	EA	0	$ 62,000.00	$ -
	Sports Fields & Courts Sub-Total				**$ 3,300,000.00**
	Recreation Amenities				
27	Chilled Drinking Fountains	EA	2	$ 16,000.00	$ 32,000.00
28	Site Furnishings (Benches, Litter Receptacles, Pet Waste Stations, Removable Bollards, Entry Gates, BBQ's)	LS	1	$ 35,000.00	$ 35,000.00
29	Entry Monuments (East & West)	EA	1	$ 35,000.00	$ 35,000.00
30	Ball Protection Fence (12' Height)	LF	1,320	$ 280.00	$ 369,600.00
30	36" CMU Parking Screen Wall	LF	0	$ 100.00	$ -
31	Concrete Retaining Wall- Avg 30" High	LF	300	$ 350.00	$ 105,000.00
32	Wayfinding Signage	LS	1	$ 38,000.00	$ 38,000.00
	Recreation Amenitites Sub-Total				**$ 614,600.00**
	General Park Landscape & Irrigation				
33	General Park Landscape & DG (not counting ballfields or multi-use fields)	SF	735,840	$ 3.00	$ 2,207,520.00
34	General Park Turf Grass (hydro-sprigged) (not counting ballfields or multi-use fields)	SF	98,240	$ 1.50	$ 147,360.00
35	General Park Drip Irrigation (not counting multi-use fields)	SF	735,840	$ 1.35	$ 993,384.00
36	General Park Turf Irrigation (not counting multi-use fields)	SF	98,240	$ 2.00	$ 196,480.00
37	Irrigation Control System & Two Wire Path	EA	1	$ 50,000.00	$ 50,000.00
	General Park Landscape & Irrigation Sub-Total				**$ 3,594,744.00**
	Architecture / Ramadas				
38	Restroom & Office Building 100' x 40'	EA	1	$ 2,000,000.00	$ 2,000,000.00
39	Restroom Building 20' x 40'	EA	0	$ 1,500,000.00	$ -
40	20' x 40' Pickleball Shade Structures w/ Seating and Paving	EA	0	$ 90,000.00	$ -
41	One Acre Maintenance Yard w/ Office and Shaded Service Bays	EA	1	$ 1,500,000.00	$ 1,500,000.00
	Architecture Sub-Total				**$ 3,500,000.00**

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Electrical & Lighting				
42	Site Electrical Service Entrance Section and Lighting Control Equipment, Primary and Secondary Power Conduits, Transformer Pad	LS	1	$ 170,000.00	$ 170,000.00
43	APS Fees	LS	1	$ 50,000.00	$ 50,000.00
44	Lighted Multi-Use Fields	EA	5	$ 300,000.00	$ 1,500,000.00
45	Pickleball Courts	EA	0	$ -	$ -
46	Maintenance Building Power and Lighting	LS	1	$ 80,000.00	$ 80,000.00
47	Restroom Lighting and Power Feed	EA	0	$ -	$ -
48	Restroom & Office Building Lighting and Power Feed	EA	1	$ 100,000.00	$ 100,000.00
49	Pickleball Shade Structure Lighting and Power	EA	0	$ -	$ -
50	Site and Pathway Lighting	LS	1	$ 1,125,000.00	$ 1,125,000.00
51	All Parking Lot and Drive Lighting	LS	1	$ 810,000.00	$ 810,000.00
52	Irrigation Booster Pump Station Power Feed	EA	1	$ 75,000.00	$ 75,000.00
53	Storage Tank Fill Pump Power Feed	EA	1	$ 75,000.00	$ 75,000.00
54	Site Electrical (receptacles, power to gates, chilled drinking fountain, etc)	LS	1	$ 250,000.00	$ 250,000.00
	Electrical & Lighting Sub-Total				**$ 4,235,000.00**
	Land Acquisition				
55	UPRR Property Acquisition	LS	1	N/A	
56	Palm Valley Blvd Right-of-Way Acquitision	LS	1	N/A	
	Project Construction Sub-Total				$ 27,644,496.75
	Construction Stakes, Lines and Grades and Asbuilts	LS	1	$ 552,900.00	$ 552,900.00
	Storm Water Pollution Prevention Plan, Maintenance and Permits	LS	1	$ 276,450.00	$ 276,450.00
	Project Contingency (30%)	AL	1	$ 8,293,350.00	$ 8,293,350.00
	Final Design/Engineering (8%)	AL	1	$ 2,211,550.00	$ 2,211,550.00
	Mobilization/Demobilization	LS	1	$ 1,658,650.00	$ 1,658,650.00
	Insurance/Taxes/Bond/GCs, etc	LS	1	$ 2,764,450.00	$ 2,764,450.00
	Project Construction Grand Total				**$ 43,401,846.75**

Figure 24: Opinion of Probable Cost - Phase 3

Goodyear Sports Complex-Preferred Alterantive - Phase 3 Far East Fields

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Grading & Utilities				
1	Site Clearing & Demolition	AC	35	$ 3,500.00	$ 122,500.00
2	Mass Grading	CY	73,847	$ 4.25	$ 313,849.75
3	Fill Import Material	CY	107	$ 18.00	$ 1,926.00
4	On-site Drainage Infrastructure (Misc. headwalls, railing, pipe, scuppers)	LS	1	$ 50,000.00	$ 50,000.00
5	48" Drain Pipe	LF	0	$ 550.00	$ -
6	84" Drain Pipe	LF	0	$ 1,000.00	$ -
7	Three 8' x8' Box Culvert	LF	0	$ 2,200.00	$ -
8	Four 8' x8' Box Culvert	LF	0	$ 2,900.00	$ -
9	2" Water Line & Extensions	LF	790	$ 85.00	$ 67,150.00
10	2" Water Meters & Backflow Preventers including Impact Fees	EA	1	$ 50,000.00	$ 50,000.00
11	Quick Coupler with Valve	EA	0	$ 600.00	$ -
12	Fire Hydrants	EA	3	$ 16,000.00	$ 48,000.00
13	6" Sewer Service & Extension	LF	285	$ 145.00	$ 41,325.00
14	8" Reclaimed Water Line	LF	0	$ 135.00	$ -
	Grading & Utilities Sub-Total				**$ 694,750.75**
	Paving, Striping, and Sidewalks				
15	Park Roadway Paving & Striping	SY	7,710	$ 65.00	$ 501,150.00
16	Parking Lot Paving & Striping	SY	9,000	$ 60.00	$ 540,000.00
17	Curb & Gutter for Parking Lots and Park Road	LF	7,120	$ 35.00	$ 249,200.00
18	6" Concrete Sidewalk w/ ABC subgrade	SF	69,386	$ 17.00	$ 1,179,562.00
	Paving & Striping Sub-Total				**$ 2,469,912.00**
	Irrigation Water Storage & Pump Yard				
19	775 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (West)	LS	0	$ 650,000.00	$ -
20	1,270 GPM Irrigation Vertical Turbine Pump & Skid and shade canopy (East)	LS	0	$ 715,000.00	$ -
21	765,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (West)	LS	0	$ 1,645,000.00	$ -
22	1,000,000 Gallon; 40' High Water Storage Tank including 8' High CMU Perimeter Wall & 5' High Retaining Wall (East)	EA	0	$ 1,800,000.00	$ -
	Water Storage Sub-Total				**$ -**
	Sports Fields & Courts				
23	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Native), and Irrigation	EA	4	$ 600,000.00	$ 2,400,000.00
24	U012 Soccer Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	0	$ 300,000.00	$ -
25	Multi-Purpose Field including Goals, Hydrosprigs (Midiron on Sand), and Irrigation	EA	0	$ 600,000.00	$ -
26	Pickleball Courts (post-tension)	EA	0	$ 62,000.00	$ -
	Sports Fields & Courts Sub-Total				**$ 2,400,000.00**
	Recreation Amenities				
27	Chilled Drinking Fountains	EA	2	$ 16,000.00	$ 32,000.00
28	Site Furnishings (Benches, Litter Receptacles, Pet Waste Stations, Removable Bollards, Entry Gates, BBQ's)	LS	1	$ 30,000.00	$ 30,000.00
29	Entry Monuments (East & West)	EA	0	$ 35,000.00	$ -
30	Ball Protection Fence (12' Height)	LF	1,060	$ 280.00	$ 296,800.00
30	36" CMU Parking Screen Wall	LF	560	$ 100.00	$ 56,000.00
31	Concrete Retaining Wall- Avg 30" High	LF	0	$ 350.00	$ -
32	Wayfinding Signage	LS	1	$ 25,000.00	$ 25,000.00
	Recreation Amenitites Sub-Total				**$ 439,800.00**
	General Park Landscape & Irrigation				
33	General Park Landscape & DG (not counting ballfields or multi-use fields)	SF	800,710	$ 3.00	$ 2,402,130.00
34	General Park Turf Grass (hydro-sprigged) (not counting ballfields or multi-use fields)	SF	52,350	$ 1.50	$ 78,525.00
35	General Park Drip Irrigation (not counting multi-use fields)	SF	800,710	$ 1.35	$ 1,080,958.50
36	General Park Turf Irrigation (not counting multi-use fields)	SF	52,350	$ 2.00	$ 104,700.00
37	Irrigation Control System & Two Wire Path	EA	0	$ 50,000.00	$ -
	General Park Landscape & Irrigation Sub-Total				**$ 3,666,313.50**
	Architecture / Ramadas				
38	Restroom & Office Building 100' x 40'	EA	0	$ 2,000,000.00	$ -
39	Restroom Building 20' x 40'	EA	1	$ 1,500,000.00	$ 1,500,000.00
40	20' x 40' Pickleball Shade Structures w/ Seating and Paving	EA	0	$ 90,000.00	$ -
41	One Acre Maintenance Yard w/ Office and Shaded Service Bays	EA	0	$ 1,500,000.00	$ -
	Architecture Sub-Total				**$ 1,500,000.00**

No.	Item Description	Unit	Quantity	Unit Price	Extended Amount
	Electrical & Lighting				
42	Site Electrical Service Entrance Section and Lighting Control Equipment, Primary and Secondary Power Conduits, Transformer Pad	LS	1	$ -	$ -
43	APS Fees	LS	1	$ -	$ -
44	Lighted Multi-Use Fields	EA	4	$ 300,000.00	$ 1,200,000.00
45	Pickleball Courts	EA	0	$ -	$ -
46	Maintenance Building Power and Lighting	LS	0	$ -	$ -
47	Restroom Lighting and Power Feed	EA	1	$ 30,000.00	$ 30,000.00
48	Restroom & Office Building Lighting and Power Feed	EA	0	$ -	$ -
49	Pickleball Shade Structure Lighting and Power	EA	0	$ -	$ -
50	Site and Pathway Lighting	LS	1	$ 765,000.00	$ 765,000.00
51	All Parking Lot and Drive Lighting	LS	1	$ 480,000.00	$ 480,000.00
52	Irrigation Booster Pump Station Power Feed	EA	0	$ -	$ -
53	Storage Tank Fill Pump Power Feed	EA	0	$ -	$ -
54	Site Electrical (receptacles, power to gates, chilled drinking fountain, etc)	LS	1	$ 200,000.00	$ 200,000.00
	Electrical & Lighting Sub-Total				**$ 2,675,000.00**
	Land Acquisition				
55	UPRR Property Acquisition	LS	1	N/A	
56	Palm Valley Blvd Right-of-Way Acquitision	LS	1	N/A	
	Project Construction Sub-Total				$ 13,845,776.25
	Construction Stakes, Lines and Grades and Asbuilts	LS	1	$ 276,900.00	$ 276,900.00
	Storm Water Pollution Prevention Plan, Maintenance and Permits	LS	1	$ 138,450.00	$ 138,450.00
	Project Contingency (30%)	AL	1	$ 4,153,750.00	$ 4,153,750.00
	Final Design/Engineering (8%)	AL	1	$ 1,107,650.00	$ 1,107,650.00
	Mobilization/Demobilization/Insurance/Bond/Taxes	LS	1	$ 830,750.00	$ 830,750.00
	Insurance/Taxes/Bond/GCs, etc	LS	1	$ 1,384,600.00	$ 1,384,600.00
	Project Construction Grand Total				**$ 21,737,876.25**

Appendix

A- Photo Log

B- Irrigation Annual Water Use & Peak Demand Calculations

C- Geotech Report

D- 2015 FCDMC White Tanks ADMP - Optional ADOT Basins Water shed Report

E- FEMA FIRM Exhibit

Appendix A

Photo Log

GOODYEAR SPORTS COMPLEX FEASIBILITY STUDY







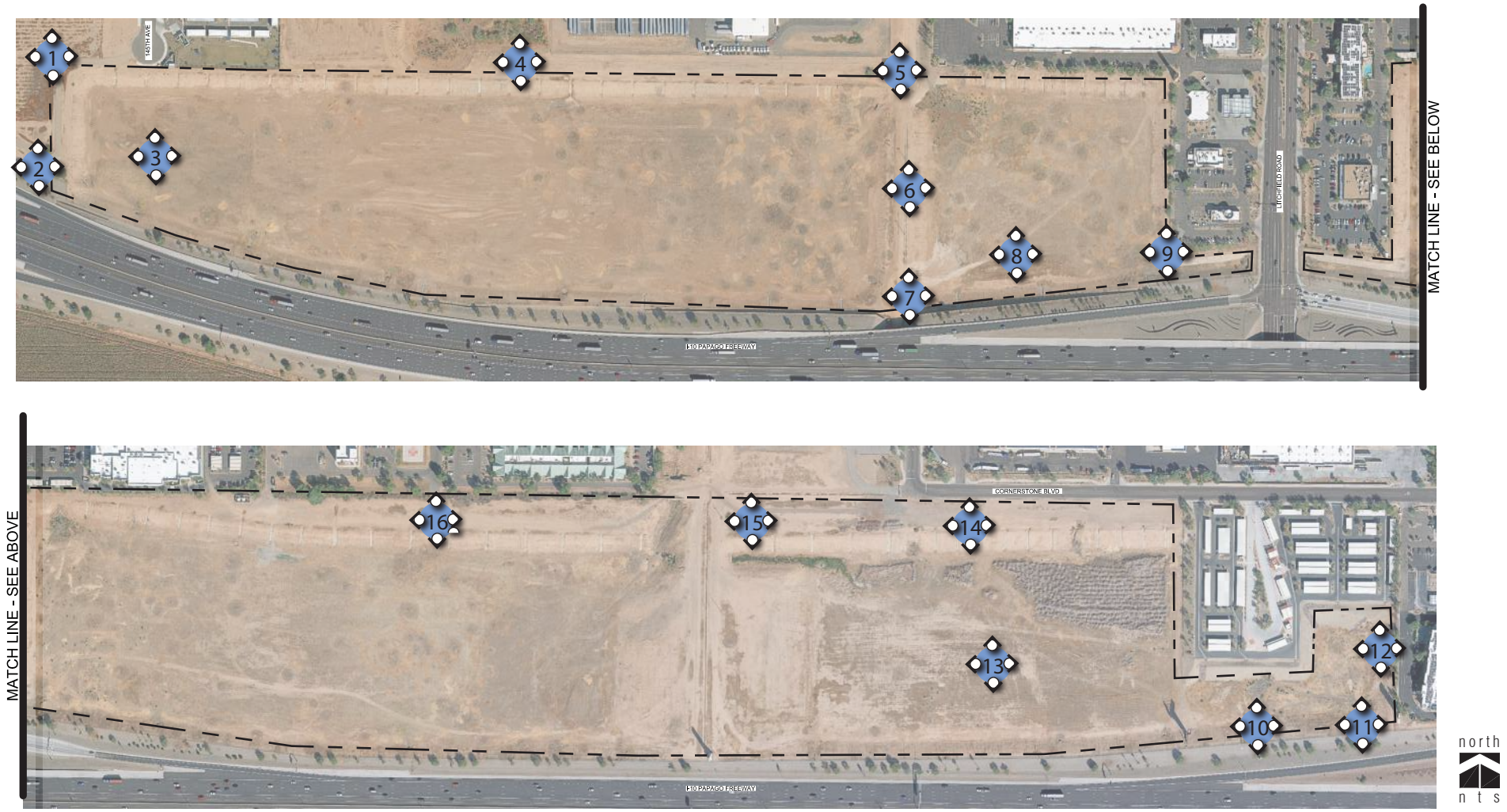






Photo Log

Site Contextual Exhibit:
Plan View



LEGEND

- *Project Limits*
- 1 — *Exhibit Location*
- 1 — *Exhibit Number*
- A — *Directional Site Photos*

Exhibit 1:
Directional Photos



Legend

1 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale









Exhibit 2:
Directional Photos



Legend

2 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

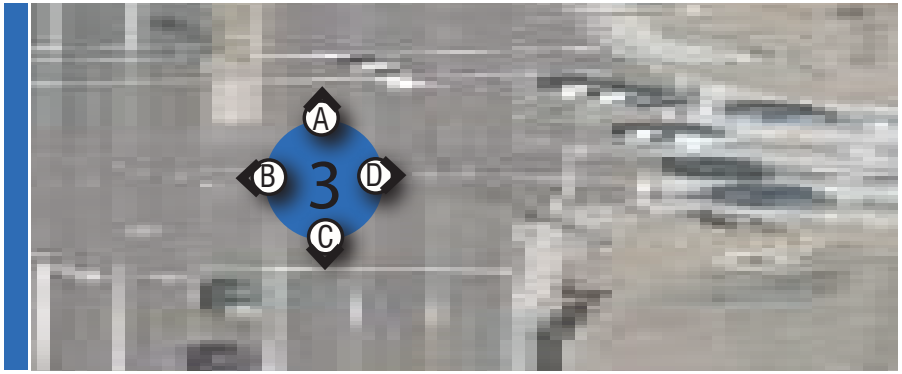








Exhibit 3:
Directional Photos



Legend

3 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

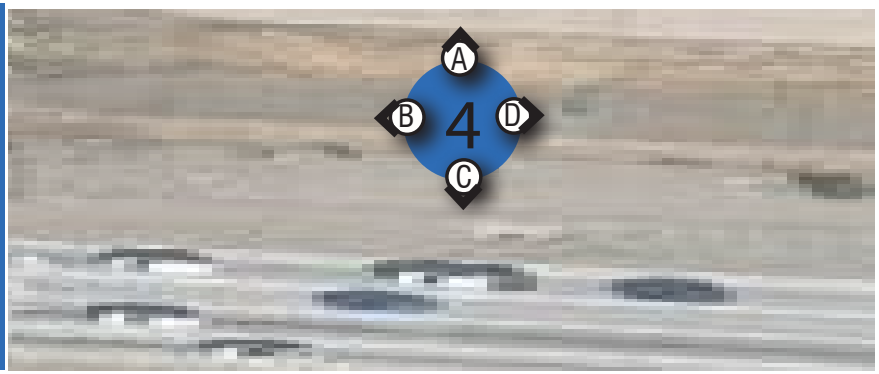








Exhibit 4:
Directional Photos



Legend

4 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

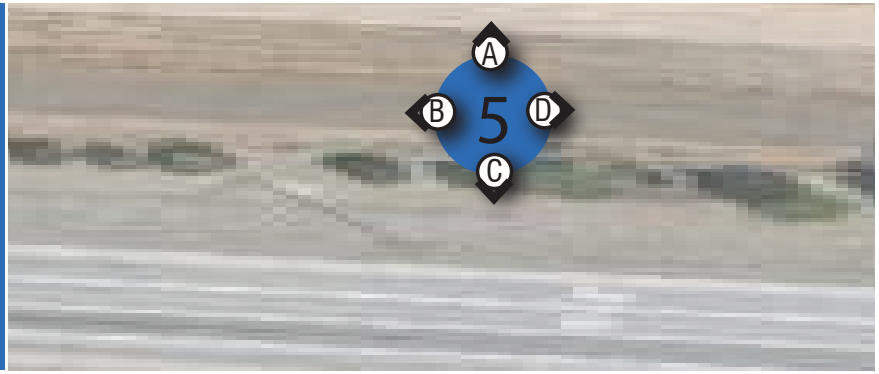








Exhibit 5:
Directional Photos



Legend

5 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

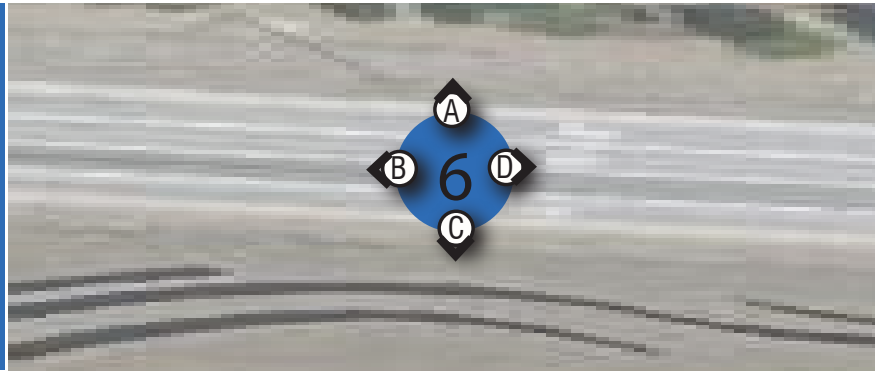








Exhibit 6:
Directional Photos



Legend

6 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

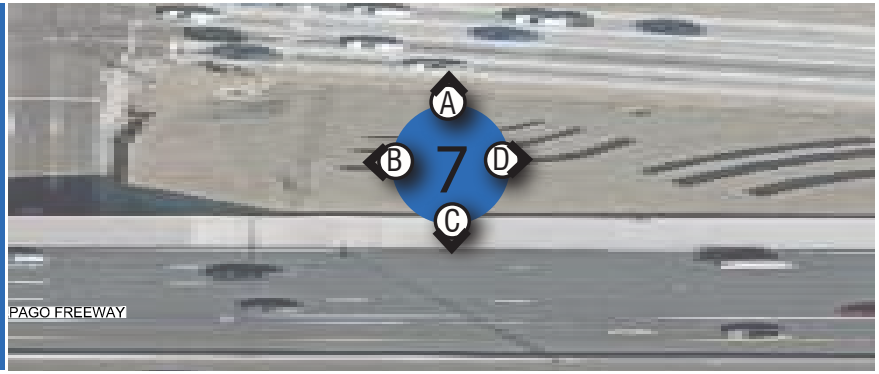








Exhibit 7:
Directional Photos



Legend

7 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

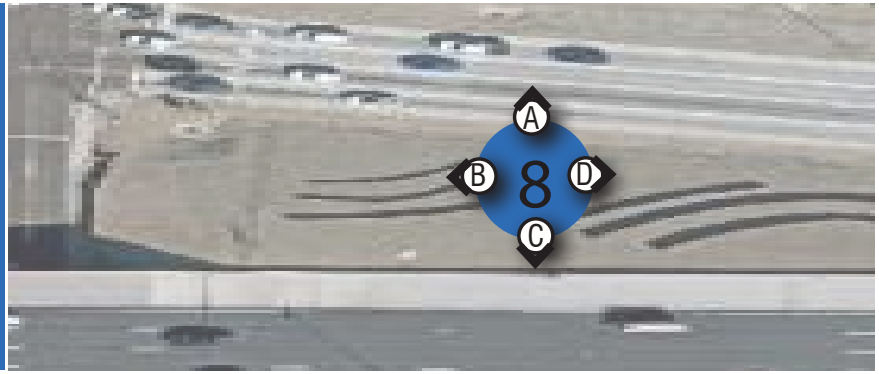








Exhibit 8:
Directional Photos



Legend

8 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

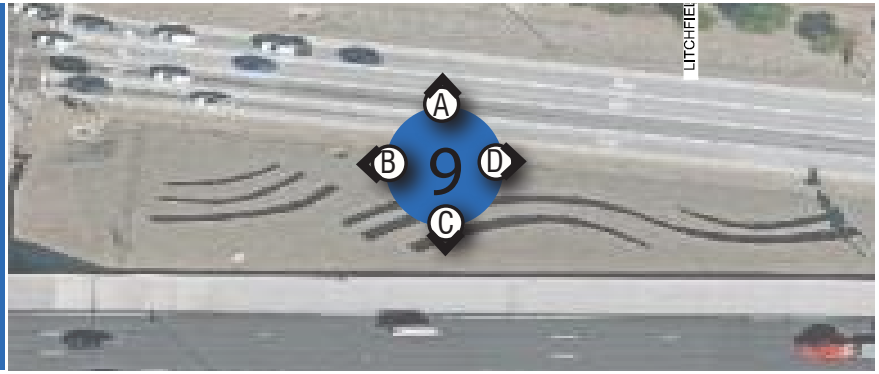








Exhibit 9:
Directional Photos



Legend

9 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

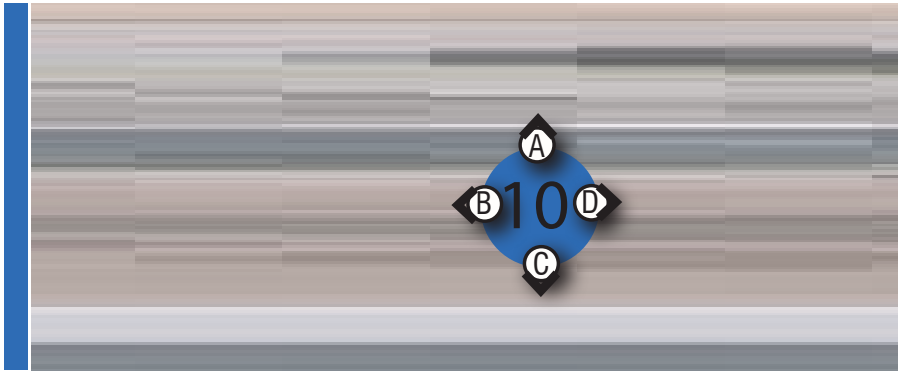








Exhibit 10:
Directional Photos



Legend

10 — *Exhibit Number*

A — *Directional Site Photos*

north — no scale

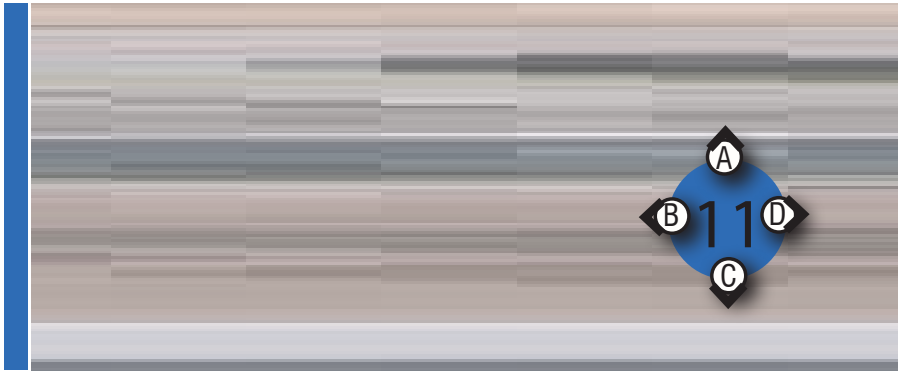








Exhibit 11:
Directional Photos



Legend

11 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

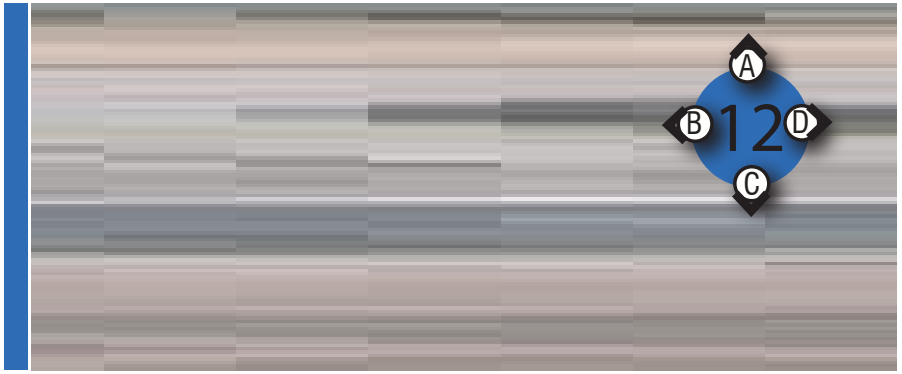








Exhibit 12:
Directional Photos



Legend

12 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

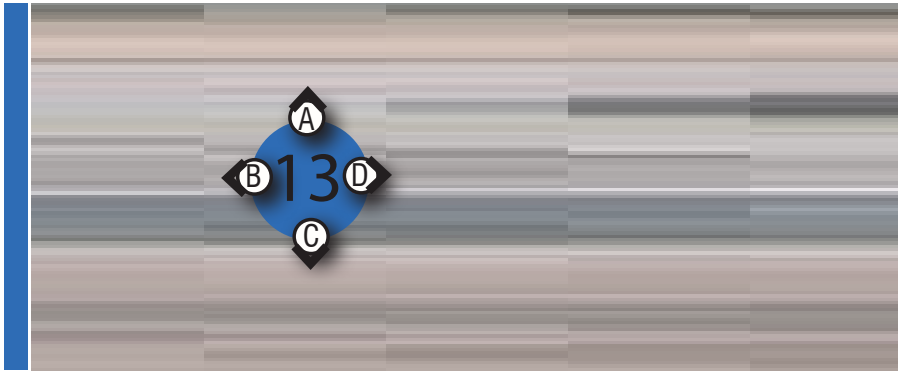








Exhibit 13:
Directional Photos



Legend

13 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

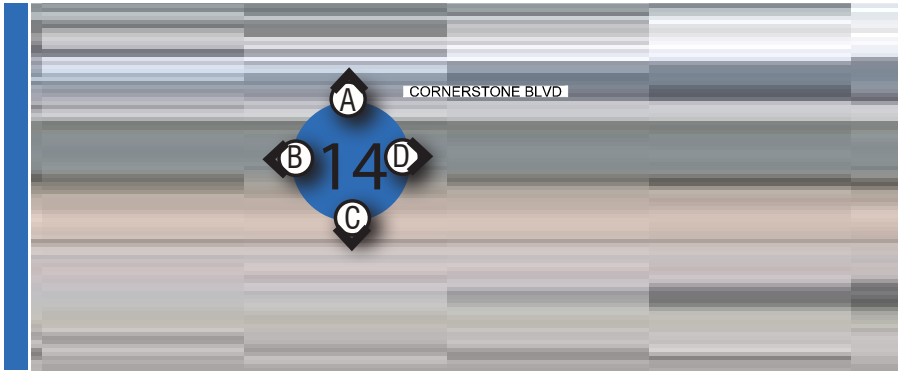








Exhibit 14:
Directional Photos



Legend

14 — *Exhibit Number*

A — *Directional Site Photos*

north — no scale

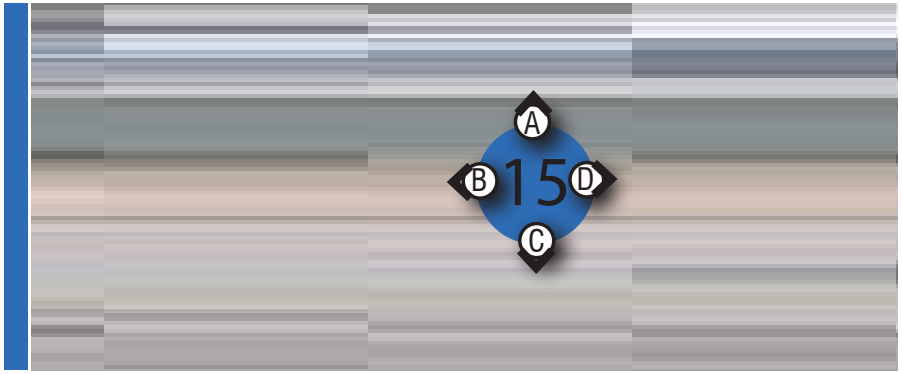








Exhibit 15:
Directional Photos



Legend

15 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale

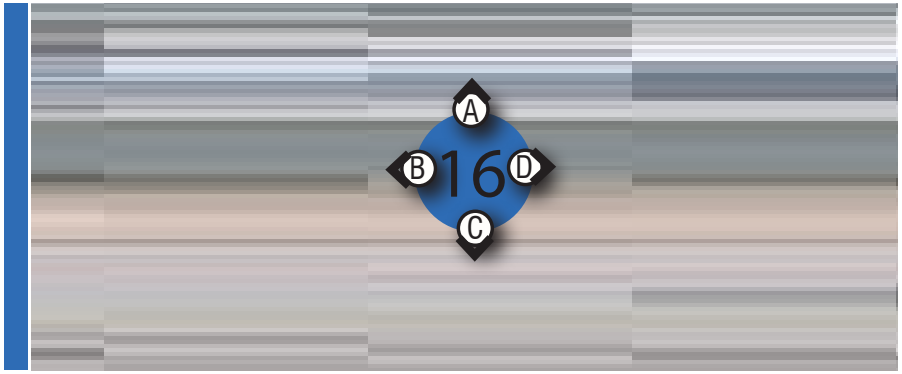








Exhibit 16:
Directional Photos



Legend

16 — *Exhibit Number*

A — *Directional Site Photos*

north

no scale









Additional Photos:













Additional Photos:













Appendix B

Irrigation Annual Water Use and Peak Demand Calculations

city of Goodyear
Sports Complex Feasibility Study (West Site)
Estimated Average Annual Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

Annual Turf Water Demand- Park Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623			
Turf Area (A) =	144,320	Square Feet	=	3.31 Acres
**Turf Landscape Coefficient (K1) =	0.65			
Turf Distribution Uniformity (DU) =	0.70			

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	235,161	20%	47,032
February	3.78	315,867	20%	63,173
March	5.70	475,888	50%	237,944
April	8.17	681,828	100%	681,828
May	9.63	804,279	100%	804,279
June	10.07	840,457	100%	840,457
July	9.75	814,019	100%	814,019
August	8.83	737,487	100%	737,487
September	7.17	598,339	100%	598,339
October	5.68	474,496	100%	474,496
November	3.67	306,127	50%	153,063
December	2.27	189,242	20%	37,848

Average Annual Turf Water Demand- Park Turf (Not Overseeded): 5,489,966 Gallons Per Year = 5.09 AFPA

Annual Turf Water Demand- Sports Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623			
Turf Area (A) =	679,900	Square Feet	=	15.61 Acres
**Turf Landscape Coefficient (K1) =	0.70			
Turf Distribution Uniformity (DU) =	0.70			

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,193,077	20%	238,615
February	3.78	1,602,536	20%	320,507
March	5.70	2,414,393	50%	1,207,196
April	8.17	3,459,218	100%	3,459,218
May	9.63	4,080,465	100%	4,080,465
June	10.07	4,264,016	100%	4,264,016
July	9.75	4,129,883	100%	4,129,883
August	8.83	3,741,603	100%	3,741,603
September	7.17	3,035,640	100%	3,035,640
October	5.68	2,407,333	100%	2,407,333
November	3.67	1,553,118	50%	776,559
December	2.27	960,109	20%	192,022

Average Annual Turf Water Demand- Sports Turf (Not Overseeded): 27,853,058 Gallons Per Year = 5.48 AFPA

Annual Plant Water Demand:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

		Trees	Shrubs	Ground Covers and Cactus	Total Landscapable Area
Plant Quantities =		750	1,350	600	2,530,000.00 Square Feet
Constant =	0.623	314	12	4	
		SF (Avg. 20' Dia. Tree)	SF (Avg. 4' Dia. Shrub)	SF (Avg. 2' Dia. GC & Cacti)	
Total Area (A) =		235,500.00	16,200.00	2,400.00	58.08 Acres
**Landscape Coefficient (K1) =		0.20	0.18	0.16	
Distribution Uniformity (DU) =	0.90				

***Reference ET Rate Per Month (Etr)		Trees - Gallons Per Month	Shrubs - Gallons Per Month	Groundcover / Cactus - Gallon Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	91,833.66	5,685.50	748.71	50%	49,134
February	3.78	123,350.54	7,636.73	1,005.66	50%	65,996
March	5.70	185,840.90	11,505.56	1,515.14	75%	149,146
April	8.17	266,263.28	16,484.58	2,170.81	100%	284,919
May	9.63	314,081.99	19,445.08	2,560.67	100%	336,088
June	10.07	328,210.24	20,319.77	2,675.85	100%	351,206
July	9.75	317,885.75	19,680.57	2,591.68	100%	340,158
August	8.83	287,999.06	17,830.26	2,348.02	100%	308,177
September	7.17	233,659.61	14,466.06	1,905.00	100%	250,031
October	5.68	185,297.51	11,471.92	1,510.71	100%	198,280
November	3.67	119,546.78	7,401.24	974.65	75%	95,942
December	2.27	73,901.64	4,575.31	602.51	50%	39,540

Average Annual Plant Water Demand- Drip: 2,468,617 Gallons Per Year = 0.13 AFPA

Combined Annual Water Demand (Turf & Plants): 35,811,641 Gallons Per Year = 109.9 AFPY

Notes:
1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent estimated average water demand for an annual (yearly) watering period.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***Average Monthly ET rate for past 5 years (2017-2021) per AZMET Weather Station 'Yuma North'
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Average annual water demands do not include any contingencies and actual demands will vary.

ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
SF = Square Feet
GPY = Gallons Per Year
AFPY = Acre Feet per Year

1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons
AFPA = Acre Feet per Acre

city of Goodyear
Sports Complex Feasibility Study (East Site)
Estimated Average Annual Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

Annual Turf Water Demand- Park Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623			
Turf Area (A) =	618,810	Square Feet	=	14.21 Acres
**Turf Landscape Coefficient (K1) =	0.65			
Turf Distribution Uniformity (DU) =	0.70			

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,008,315	20%	201,663
February	3.78	1,354,364	20%	270,873
March	5.70	2,040,495	50%	1,020,248
April	8.17	2,923,516	100%	2,923,516
May	9.63	3,448,556	100%	3,448,556
June	10.07	3,603,681	100%	3,603,681
July	9.75	3,490,320	100%	3,490,320
August	8.83	3,162,171	100%	3,162,171
September	7.17	2,565,535	100%	2,565,535
October	5.68	2,034,529	100%	2,034,529
November	3.67	1,312,599	50%	656,300
December	2.27	811,425	20%	162,285

Average Annual Turf Water Demand- Park Turf (Not Overseeded): 23,539,676 Gallons Per Year = 5.09 AFPA

Annual Turf Water Demand- Sports Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623			
Turf Area (A) =	632,100	Square Feet	=	14.51 Acres
**Turf Landscape Coefficient (K1) =	0.70			
Turf Distribution Uniformity (DU) =	0.70			

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,109,199	20%	221,840
February	3.78	1,489,870	20%	297,974
March	5.70	2,244,650	50%	1,122,325
April	8.17	3,216,019	100%	3,216,019
May	9.63	3,793,590	100%	3,793,590
June	10.07	3,964,236	100%	3,964,236
July	9.75	3,839,533	100%	3,839,533
August	8.83	3,478,552	100%	3,478,552
September	7.17	2,822,221	100%	2,822,221
October	5.68	2,238,087	100%	2,238,087
November	3.67	1,443,927	50%	721,964
December	2.27	892,609	20%	178,522

Average Annual Turf Water Demand- Sports Turf (Not Overseeded): 25,894,864 Gallons Per Year = 5.48 AFPA

Annual Plant Water Demand:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

		Trees	Shrubs	Ground Covers and Cactus	Total Landscapable Area
Plant Quantities =		750	1,350	600	3,415,000.00 Square Feet
Constant =	0.623	314	12	4	
		SF (Avg. 20' Dia. Tree)	SF (Avg. 4' Dia. Shrub)	SF (Avg. 2' Dia. GC & Cacti)	
Total Area (A) =		235,500.00	16,200.00	2,400.00	78.40 Acres
**Landscape Coefficient (K1) =		0.20	0.18	0.16	
Distribution Uniformity (DU) =	0.90				

***Reference ET Rate Per Month (Etr)		Trees - Gallons Per Month	Shrubs - Gallons Per Month	Groundcover / Cactus - Gallon Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	91,833.66	5,685.50	748.71	50%	49,134
February	3.78	123,350.54	7,636.73	1,005.66	50%	65,996
March	5.70	185,840.90	11,505.56	1,515.14	75%	149,146
April	8.17	266,263.28	16,484.58	2,170.81	100%	284,919
May	9.63	314,081.99	19,445.08	2,560.67	100%	336,088
June	10.07	328,210.24	20,319.77	2,675.85	100%	351,206
July	9.75	317,885.75	19,680.57	2,591.68	100%	340,158
August	8.83	287,999.06	17,830.26	2,348.02	100%	308,177
September	7.17	233,659.61	14,466.06	1,905.00	100%	250,031
October	5.68	185,297.51	11,471.92	1,510.71	100%	198,280
November	3.67	119,546.78	7,401.24	974.65	75%	95,942
December	2.27	73,901.64	4,575.31	602.51	50%	39,540

Average Annual Plant Water Demand- Drip: 2,468,617 Gallons Per Year = 0.10 AFPA

Combined Annual Water Demand (Turf & Plants): 51,903,156 Gallons Per Year = 159.3 AFPY

Notes:
1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent estimated average water demand for an annual (yearly) watering period.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***Average Monthly ET rate for past 5 years (2017-2021) per AZMET Weather Station 'Yuma North'
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Average annual water demands do not include any contingencies and actual demands will vary.

ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
SF = Square Feet
GPY = Gallons Per Year

1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons

city of Goodyear
Sports Complex Feasibility Study (West Site)
Estimated Peak Daily Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

City's Preferred Irrigation Daily Water Window:	7	Hours Per Day	(11 PM - 6 AM)
City's Preferred Irrigation Weekly Water Schedule:	5	Days Per Week	

Peak Daily Turf Water Demand- Native Soil Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	144,320	Square Feet	=	3.31	Acres
Turf Landscape Coefficient (K1) =	0.65	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				

Peak Daily Turf Water Demand- Native Soil Based:		45,919.02	Gallons Per Day
20% Continency =	+	9,183.80	Gallons Per Day
Peak Daily Turf Water Demand- Native Soil Based Turf (with Contingency):		**55,103**	**Gallons Per Day** = **131** **Gallons Per Minute**

Peak Daily Turf Water Demand- Sand Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	679,900	Square Feet	=	15.61	Acres
Turf Landscape Coefficient (K1) =	0.70	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				

Peak Daily Turf Water Demand with Continency- Sand Based Turf =		232,967.74	Gallons Per Day
20% Continency =	+	46,593.55	Gallons Per Day
Peak Daily Turf Water Demand- Sand Based Turf (with Continency):		**279,561**	**Gallons Per Day** = **666** **Gallons Per Minute**

Peak Daily Plant Water Demand- Drip:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623						
	Trees:		Shrubs:			Ground Covers & Cacti:	
Plant Area (A) =	314	SF (Avg. 20' Dia. Tree)	12	SF (Avg. 4' Dia. Shrub)		4	SF (Avg. 2' Dia. GC & Cacti)
**Plant Landscape Coefficient (K1) =	0.20	Trees	0.18	Shrubs		0.16	Ground Covers & Cacti
Reference ET Rate (Etr) =	0.550	Inches Per Day***					
Drip Distribution Uniformity (DU) =	0.90			**Plant Totals**			
Trees Peak Daily Water Demand:	23.91	GPD Each Tree	x	750	Trees =	17,932	Gallons Per Day (Trees)
Shrubs Peak Daily Water Demand:	0.82	GPD Each Shrub	x	1,350	Shrubs =	1,110	Gallons Per Year (Shrubs)
GCs & Cacti Peak Daily Water Demand:	0.24	GPD Each GC/Cacti	x	600	GCs & Cacti =	146	Gallons Per Year (GCs & Cacti)

Combined Peak Daily Plant Water Demand- Drip:		19,188.40	Gallons Per day
20% Contingency:	+	3,837.68	Gallons Per day
Peak Daily Plant Water Demand- Drip (with Contingency):		**23,026**	**Gallons Per Day** = **55** **Gallons Per Minute**

Peak Daily Lake Evaporation Water Demand:

Lake Surface Area =	0.00	Acres	x	27,154	Gallons Per Acre Inch	=	0	Gallons Per Acre Inch
Peak Daily Lake Surface Evaporation =	0.38	Inches Per Day****	x	0	Gallons Per Acre Inch	=	0	Gallons Per Day

Overall Peak Water Demands (Turf & Plants):		**357,690**	**Gallons Per Day** = **852** **Gallons Per Minute**

Notes:
1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent water demands for a daily watering period during peak season (summer) when ET rate is at highest point of year.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***= Highest weekly average ETr rate in last 10 years per AZMET's Weather Station.
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Peak daily water demands include a contingency to ensure daily demand is met considering pump & pipes are sized per this flow.

ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
GPM = Gallons Per Minute
GPD = Gallons Per Day
SF = Square Feet
1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons

city of Goodyear
Sports Complex Feasibility Study (East Site)
Estimated Peak Daily Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

City's Preferred Irrigation Daily Water Window:	7	Hours Per Day	(11 PM - 6 AM)
City's Preferred Irrigation Weekly Water Schedule:	5	Days Per Week	

Peak Daily Turf Water Demand- Native Soil Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	618,810	Square Feet	=	14.21	Acres
Turf Landscape Coefficient (K1) =	0.65	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				

Peak Daily Turf Water Demand- Native Soil Based:		196,889.87	Gallons Per Day
20% Continency =	+	39,377.97	Gallons Per Day
Peak Daily Turf Water Demand- Native Soil Based Turf (with Contingency):		**236,268**	**Gallons Per Day** = **563** **Gallons Per Minute**

Peak Daily Turf Water Demand- Sand Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	632,100	Square Feet	=	14.51	Acres
Turf Landscape Coefficient (K1) =	0.70	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				

Peak Daily Turf Water Demand with Continency- Sand Based Turf =		216,589.07	Gallons Per Day
20% Continency =	+	43,317.81	Gallons Per Day
Peak Daily Turf Water Demand- Sand Based Turf (with Continency):		**259,907**	**Gallons Per Day** = **619** **Gallons Per Minute**

Peak Daily Plant Water Demand- Drip:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623						
	Trees:		Shrubs:			Ground Covers & Cacti:	
Plant Area (A) =	314	SF (Avg. 20' Dia. Tree)	12	SF (Avg. 4' Dia. Shrub)		4	SF (Avg. 2' Dia. GC & Cacti)
**Plant Landscape Coefficient (K1) =	0.20	Trees	0.18	Shrubs		0.16	Ground Covers & Cacti
Reference ET Rate (Etr) =	0.550	Inches Per Day***					
Drip Distribution Uniformity (DU) =	0.90			**Plant Totals**			
Trees Peak Daily Water Demand:	23.91	GPD Each Tree	x	750	Trees =	17,932	Gallons Per Day (Trees)
Shrubs Peak Daily Water Demand:	0.82	GPD Each Shrub	x	1,350	Shrubs =	1,110	Gallons Per Year (Shrubs)
GCs & Cacti Peak Daily Water Demand:	0.24	GPD Each GC/Cacti	x	600	GCs & Cacti =	146	Gallons Per Year (GCs & Cacti)

Combined Peak Daily Plant Water Demand- Drip:		19,188.40	Gallons Per day
20% Contingency:	+	3,837.68	Gallons Per day
Peak Daily Plant Water Demand- Drip (with Contingency):		**23,026**	**Gallons Per Day** = **55** **Gallons Per Minute**

Overall Peak Water Demand:

Combined Turf & Plant Peak Daily Use =	519,201	Gallons Per Day	/	0	Gallons Per Acre Inch	=	0.00	Inches Per Day

Overall Peak Water Demands (Turf & Plants):		**519,201**	**Gallons Per Day** = **1,236** **Gallons Per Minute**

Notes:
1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent water demands for a daily watering period during peak season (summer) when ET rate is at highest point of year.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***= Highest weekly average ETr rate in last 10 years per AZMET's Weather Station.
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Peak daily water demands include a contingency to ensure daily demand is met considering pump & pipes are sized per this flow.

ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
GPM = Gallons Per Minute
GPD = Gallons Per Day
SF = Square Feet
1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons

city of Goodyear
Sports Complex Feasibility Study (West Site) (Winter Rye)
Estimated Average Annual Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design

5/21/2024

Annual Turf Water Demand- Park Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	144,320	Square Feet	=	3.31	Acres
**Turf Landscape Coefficient (K1) =	0.65				
Turf Distribution Uniformity (DU) =	0.70				

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	235,161	20%	47,032
February	3.78	315,867	20%	63,173
March	5.70	475,888	50%	237,944
April	8.17	681,828	100%	681,828
May	9.63	804,279	100%	804,279
June	10.07	840,457	100%	840,457
July	9.75	814,019	100%	814,019
August	8.83	737,487	100%	737,487
September	7.17	598,339	100%	598,339
October	5.68	474,496	100%	474,496
November	3.67	306,127	50%	153,063
December	2.27	189,242	20%	37,848

Average Annual Turf Water Demand- Park Turf (Not Overseeded): 5,489,966 Gallons Per Year = 5.09 AFPA

Annual Turf Water Demand- Sports Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	679,900	Square Feet	=	15.61	Acres
**Turf Landscape Coefficient (K1) =	0.70				
Turf Distribution Uniformity (DU) =	0.70				

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,193,077	100%	1,193,077
February	3.78	1,602,536	100%	1,602,536
March	5.70	2,414,393	100%	2,414,393
April	8.17	3,459,218	100%	3,459,218
May	9.63	4,080,465	100%	4,080,465
June	10.07	4,264,016	100%	4,264,016
July	9.75	4,129,883	100%	4,129,883
August	8.83	3,741,603	100%	3,741,603
September	7.17	3,035,640	100%	3,035,640
October	5.68	2,407,333	100%	2,407,333
November	3.67	1,553,118	100%	1,553,118
December	2.27	960,109	100%	960,109

Average Annual Turf Water Demand- Sports Turf (Not Overseeded): 32,841,391 Gallons Per Year = 6.46 AFPA

Annual Plant Water Demand:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

		Trees	Shrubs	Ground Covers and Cactus	Total Landscapable Area
Plant Quantities =		750	1,350	600	2,530,000.00 Square Feet
Constant =	0.623	314	12	4	
		SF (Avg. 20' Dia. Tree)	SF (Avg. 4' Dia. Shrub)	SF (Avg. 2' Dia. GC & Cacti)	
Total Area (A) =		235,500.00	16,200.00	2,400.00	58.08 Acres
**Landscape Coefficient (K1) =		0.20	0.18	0.16	
Distribution Uniformity (DU) =	0.90				

***Reference ET Rate Per Month (Etr)		Trees - Gallons Per Month	Shrubs - Gallons Per Month	Groundcover / Cactus - Gallon Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	91,833.66	5,685.50	748.71	50%	49,134
February	3.78	123,350.54	7,636.73	1,005.66	50%	65,996
March	5.70	185,840.90	11,505.56	1,515.14	75%	149,146
April	8.17	266,263.28	16,484.58	2,170.81	100%	284,919
May	9.63	314,081.99	19,445.08	2,560.67	100%	336,088
June	10.07	328,210.24	20,319.77	2,675.85	100%	351,206
July	9.75	317,885.75	19,680.57	2,591.68	100%	340,158
August	8.83	287,999.06	17,830.26	2,348.02	100%	308,177
September	7.17	233,659.61	14,466.06	1,905.00	100%	250,031
October	5.68	185,297.51	11,471.92	1,510.71	100%	198,280
November	3.67	119,546.78	7,401.24	974.65	75%	95,942
December	2.27	73,901.64	4,575.31	602.51	50%	39,540

Average Annual Plant Water Demand- Drip: 2,468,617 Gallons Per Year = 0.13 AFPA

Combined Annual Water Demand (Turf & Plants): 40,799,974 Gallons Per Year = 125.2 AFPY

Notes:

1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent estimated average water demand for an annual (yearly) watering period.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***Average Monthly ET rate for past 5 years (2017-2021) per AZMET Weather Station 'Yuma North'
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Average annual water demands do not include any contingencies and actual demands will vary.

ET = Evapotranspiration

AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension

SF = Square Feet

GPY = Gallons Per Year

AFPY = Acre Feet per Year

1 Acre = 43,560 Square Feet

1 Acre Feet of Water = 325,851 Gallons

1 Acre Inch of Water = 27,154 Gallons

AFPA = Acre Feet per Acre

city of Goodyear
Sports Complex Feasibility Study (East Site) (Winter Rye)
Estimated Average Annual Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design

5/21/2024

Annual Turf Water Demand- Park Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	618,810	Square Feet	=	14.21	Acres
**Turf Landscape Coefficient (K1) =	0.65				
Turf Distribution Uniformity (DU) =	0.70				

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,008,315	20%	201,663
February	3.78	1,354,364	20%	270,873
March	5.70	2,040,495	50%	1,020,248
April	8.17	2,923,516	100%	2,923,516
May	9.63	3,448,556	100%	3,448,556
June	10.07	3,603,681	100%	3,603,681
July	9.75	3,490,320	100%	3,490,320
August	8.83	3,162,171	100%	3,162,171
September	7.17	2,565,535	100%	2,565,535
October	5.68	2,034,529	100%	2,034,529
November	3.67	1,312,599	50%	656,300
December	2.27	811,425	20%	162,285

Average Annual Turf Water Demand- Park Turf (Not Overseeded): 23,539,676 Gallons Per Year = 5.09 AFPA

Annual Turf Water Demand- Sports Turf:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	632,100	Square Feet	=	14.51	Acres
**Turf Landscape Coefficient (K1) =	0.70				
Turf Distribution Uniformity (DU) =	0.70				

Reference ET Rate Per Month (Etr)		Gallons Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	1,109,199	100%	1,109,199
February	3.78	1,489,870	100%	1,489,870
March	5.70	2,244,650	100%	2,244,650
April	8.17	3,216,019	100%	3,216,019
May	9.63	3,793,590	100%	3,793,590
June	10.07	3,964,236	100%	3,964,236
July	9.75	3,839,533	100%	3,839,533
August	8.83	3,478,552	100%	3,478,552
September	7.17	2,822,221	100%	2,822,221
October	5.68	2,238,087	100%	2,238,087
November	3.67	1,443,927	100%	1,443,927
December	2.27	892,609	100%	892,609

Average Annual Turf Water Demand- Sports Turf (Not Overseeded): 30,532,495 Gallons Per Year = 6.46 AFPA

Annual Plant Water Demand:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

		Trees	Shrubs	Ground Covers and Cactus	Total Landscapable Area
Plant Quantities =		750	1,350	600	3,415,000.00 Square Feet
Constant =	0.623	314	12	4	
		SF (Avg. 20' Dia. Tree)	SF (Avg. 4' Dia. Shrub)	SF (Avg. 2' Dia. GC & Cacti)	
Total Area (A) =		235,500.00	16,200.00	2,400.00	78.40 Acres
**Landscape Coefficient (K1) =		0.20	0.18	0.16	
Distribution Uniformity (DU) =	0.90				

***Reference ET Rate Per Month (Etr)		Trees - Gallons Per Month	Shrubs - Gallons Per Month	Groundcover / Cactus - Gallon Per Month	Watering Season Factor (in Percent)	Total Gallons Per Month
January	2.82	91,833.66	5,685.50	748.71	50%	49,134
February	3.78	123,350.54	7,636.73	1,005.66	50%	65,996
March	5.70	185,840.90	11,505.56	1,515.14	75%	149,146
April	8.17	266,263.28	16,484.58	2,170.81	100%	284,919
May	9.63	314,081.99	19,445.08	2,560.67	100%	336,088
June	10.07	328,210.24	20,319.77	2,675.85	100%	351,206
July	9.75	317,885.75	19,680.57	2,591.68	100%	340,158
August	8.83	287,999.06	17,830.26	2,348.02	100%	308,177
September	7.17	233,659.61	14,466.06	1,905.00	100%	250,031
October	5.68	185,297.51	11,471.92	1,510.71	100%	198,280
November	3.67	119,546.78	7,401.24	974.65	75%	95,942
December	2.27	73,901.64	4,575.31	602.51	50%	39,540

Average Annual Plant Water Demand- Drip: 2,468,617 Gallons Per Year = 0.10 AFPA

Combined Annual Water Demand (Turf & Plants): 56,540,787 Gallons Per Year = 173.5 AFPY

Notes:

1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent estimated average water demand for an annual (yearly) watering period.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***Average Monthly ET rate for past 5 years (2017-2021) per AZMET Weather Station 'Yuma North'
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Average annual water demands do not include any contingencies and actual demands will vary.

ET = Evapotranspiration

AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension

SF = Square Feet

GPY = Gallons Per Year

AFPY = Acre Feet per Year

1 Acre = 43,560 Square Feet

1 Acre Feet of Water = 325,851 Gallons

1 Acre Inch of Water = 27,154 Gallons

AFPA = Acre Feet per Acre

city of Goodyear
Sports Complex Feasibility Study (West Site) (Winter Rye)
Estimated Peak Daily Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

City's Preferred Irrigation Daily Water Window:	7	Hours Per Day	(11 PM - 6 AM)				
City's Preferred Irrigation Weekly Water Schedule:	5	Days Per Week					

Peak Daily Turf Water Demand- Native Soil Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	144,320	Square Feet	=	3.31	Acres
Turf Landscape Coefficient (K1) =	0.65	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				
Peak Daily Turf Water Demand- Native Soil Based:				45,919.02	Gallons Per Day
20% Contingency =			+	9,183.80	Gallons Per Day
Peak Daily Turf Water Demand- Native Soil Based Turf (with Contingency):				**55,103**	**Gallons Per Day**

=	**131**	**Gallons Per Minute**	

Peak Daily Turf Water Demand- Sand Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	679,900	Square Feet	=	15.61	Acres
Turf Landscape Coefficient (K1) =	0.70	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				
Peak Daily Turf Water Demand with Continency- Sand Based Turf =				232,967.74	Gallons Per Day
20% Continency =			+	46,593.55	Gallons Per Day
Peak Daily Turf Water Demand- Sand Based Turf (with Contingency):				**279,561**	**Gallons Per Day**

=	**666**	**Gallons Per Minute**	

Peak Daily Plant Water Demand- Drip:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623								
	Trees:			Shrubs:			Ground Covers & Cacti:		
Plant Area (A) =	314	SF (Avg. 20' Dia. Tree)		12	SF (Avg. 4' Dia. Shrub)		4	SF (Avg. 2' Dia. GC & Cacti)	
**Plant Landscape Coefficient (K1) =	0.20	Trees		0.18	Shrubs		0.16	Ground Covers & Cacti	
Reference ET Rate (Etr) =	0.550	Inches Per Day***							
Drip Distribution Uniformity (DU) =	0.90				**Plant Totals**				
Trees Peak Daily Water Demand:	23.91	GPD Each Tree	x		750	Trees =	17,932	Gallons Per Day (Trees)	
Shrubs Peak Daily Water Demand:	0.82	GPD Each Shrub	x		1,350	Shrubs =	1,110	Gallons Per Year (Shrubs)	
GCs & Cacti Peak Daily Water Demand:	0.24	GPD Each GC/Cacti	x		600	GCs & Cacti =	146	Gallons Per Year (GCs & Cacti)	

Combined Peak Daily Plant Water Demand- Drip:		19,188.40	Gallons Per day
20% Contingency:	+	3,837.68	Gallons Per day
Peak Daily Plant Water Demand- Drip (with Contingency):		**23,026**	**Gallons Per Day**

=	**55**	**Gallons Per Minute**	

Peak Daily Lake Evaporation Water Demand:

Lake Surface Area =	0.00	Acres	x	27,154	Gallons Per Acre Inch	=	0	Gallons Per Acre Inch
Peak Daily Lake Surface Evaporation =	0.38	Inches Per Day****	x	0	Gallons Per Acre Inch	=	0	Gallons Per Day

Overall Peak Water Demands (Turf & Plants):	**357,690**	**Gallons Per Day**	**=**

852	**Gallons Per Minute**	

Notes:

1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent water demands for a daily watering period during peak season (summer) when ET rate is at highest point of year.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***= Highest weekly average ETr rate in last 10 years per AZMET's Weather Station.
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Peak daily water demands include a contingency to ensure daily demand is met considering pump & pipes are sized per this flow.

ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
GPM = Gallons Per Minute
GPD = Gallons Per Day

SF = Square Feet
1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons

city of Goodyear
Sports Complex Feasibility Study (East Site) (Winter Rye)
Estimated Peak Daily Irrigation Water Demands

Prepared By: J2 Engineering & Environmental Design
5/21/2024

City's Preferred Irrigation Daily Water Window:	7	Hours Per Day	(11 PM - 6 AM)				
City's Preferred Irrigation Weekly Water Schedule:	5	Days Per Week					

Peak Daily Turf Water Demand- Native Soil Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	618,810	Square Feet	=	14.21	Acres
Turf Landscape Coefficient (K1) =	0.65	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				
Peak Daily Turf Water Demand- Native Soil Based:				196,889.87	Gallons Per Day
20% Continency =			+	39,377.97	Gallons Per Day
Peak Daily Turf Water Demand- Native Soil Based Turf (with Contingency):				**236,268**	**Gallons Per Day**

=	**563**	**Gallons Per Minute**	

Peak Daily Turf Water Demand- Sand Based:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623				
Turf Area (A) =	632,100	Square Feet	=	14.51	Acres
Turf Landscape Coefficient (K1) =	0.70	**			
Reference ET Rate (Etr) =	0.550	Inches Per Day***			
Turf Distribution Uniformity (DU) =	0.70				
Peak Daily Turf Water Demand with Continency- Sand Based Turf =				216,589.07	Gallons Per Day
20% Continency =			+	43,317.81	Gallons Per Day
Peak Daily Turf Water Demand- Sand Based Turf (with Contingency):				**259,907**	**Gallons Per Day**

=	**619**	**Gallons Per Minute**	

Peak Daily Plant Water Demand- Drip:

Formula: Gallons = 0.623 x A x K1 x Etr / DU

Formula Variables:

Constant =	0.623								
	Trees:			Shrubs:			Ground Covers & Cacti:		
Plant Area (A) =	314	SF (Avg. 20' Dia. Tree)		12	SF (Avg. 4' Dia. Shrub)		4	SF (Avg. 2' Dia. GC & Cacti)	
**Plant Landscape Coefficient (K1) =	0.20	Trees		0.18	Shrubs		0.16	Ground Covers & Cacti	
Reference ET Rate (Etr) =	0.550	Inches Per Day***							
Drip Distribution Uniformity (DU) =	0.90				**Plant Totals**				
Trees Peak Daily Water Demand:	23.91	GPD Each Tree	x		750	Trees =	17,932	Gallons Per Day (Trees)	
Shrubs Peak Daily Water Demand:	0.82	GPD Each Shrub	x		1,350	Shrubs =	1,110	Gallons Per Year (Shrubs)	
GCs & Cacti Peak Daily Water Demand:	0.24	GPD Each GC/Cacti	x		600	GCs & Cacti =	146	Gallons Per Year (GCs & Cacti)	

Combined Peak Daily Plant Water Demand- Drip:		19,188.40	Gallons Per day
20% Contingency:	+	3,837.68	Gallons Per day
Peak Daily Plant Water Demand- Drip (with Contingency):		**23,026**	**Gallons Per Day**

=	**55**	**Gallons Per Minute**	

Overall Peak Water Demand:

Combined Turf & Plant Peak Daily Use =	519,201	Gallons Per Day	/	0	Gallons Per Acre Inch	=	0.00	Inches Per Day

Overall Peak Water Demands (Turf & Plants):	**519,201**	**Gallons Per Day**	**=**

1,236	**Gallons Per Minute**	

Notes:

1. Actual water demands will vary depending on amount of overseeded turf areas, climate conditions, rainfall, and controller program settings.
2. Calcualtions shown this sheet represent water demands for a daily watering period during peak season (summer) when ET rate is at highest point of year.
3. **Landscape (Crop) Coefficients for Turf per University of Arizona published research material adjusted per estimated seasonal usage for site.
4. ***= Highest weekly average ETr rate in last 10 years per AZMET's Weather Station.
5. ****Per 'Evaporation From Open Water Surfaces in Arizona' Report by Keith Cooley (1970) with additional 5.0% global warming factor.
6. Peak daily water demands include a contingency to ensure daily demand is met considering pump & pipes are sized per this flow.

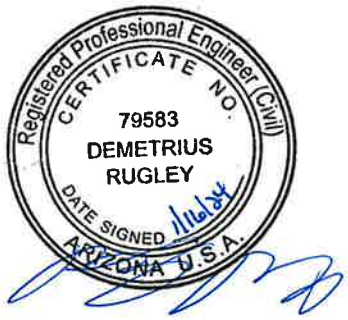
ET = Evapotranspiration
AZMET = Arizona Meteorological Network by UofA's AZ Cooperative Extension
GPM = Gallons Per Minute
GPD = Gallons Per Day

SF = Square Feet
1 Acre = 43,560 Square Feet
1 Acre Feet of Water = 325,851 Gallons
1 Acre Inch of Water = 27,154 Gallons

Appendix C

Geotech Report

Geotechnical Engineering Report
Goodyear Sports Complex Feasibility Study
1-10 and Litchfield Road
Goodyear, Arizona
RAMM Project No. G29478



For:
J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040

◆◆◆

By:
Ricker • Atkinson • McBee • Morman & Associates, Inc.
2105 South Hardy Drive, Suite 13
Tempe, Arizona 85282

RICKER • ATKINSON • McBEE • MORMAN & ASSOCIATES, INC.
Geotechnical Engineering • Construction Materials Testing
R·A·M·M

J2 Engineering and Environmental Design
4649 East Cotton Gin Loop, Suite B2
Phoenix, Arizona 85040

January 16, 2023

Attention: Aaron Allan

Subject: Geotechnical Engineering Report
Goodyear Sports Complex Feasibility Study
I-10 and Litchfield
Goodyear, Arizona

RAMM Project No. G29478

Attached to this letter is the Geotechnical Engineering Report for the proposed Goodyear Sports Complex, to be located in Goodyear, Arizona.

As presently planned, the proposed project will at least consist of lightly loaded structures such as restrooms, shade structures, CMU walls, light poles and adjacent paved parking and drives constructed within existing retention basins. The results of our field explorations; laboratory testing; and engineering analysis, evaluation and recommendations are presented in this report.

The following is a brief summary of selected recommendations:

A. Spread Foundations:

- Support on native undisturbed site soils and/or compacted fill.
- Found at least 2.0 feet below lowest adjacent finished grade.
- Design for allowable bearing pressure of 2000 psf.

B. Drilled Pier Foundations:

- Support on undisturbed native site soils.
- Found at least 5.0 feet below lowest adjacent finished grade.
- Design for allowable end bearing pressure of 3500 psf.

C. Site Soils:

- Use as fill and backfill in all areas of the proposed development.

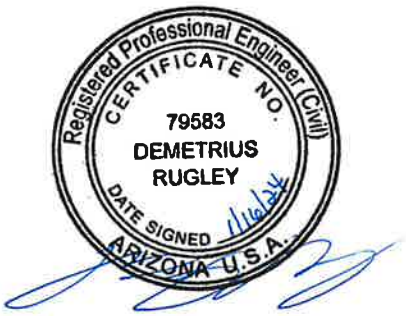
D. Pavement Sections:

- Automobile Parking Areas and Drives – 2.0 inches of asphalt concrete on 5.0 inches of base material; or 5.0 inches of Portland cement concrete.
- Truck Drives and Fire Lanes –3.0 inches of asphalt concrete on 6.0 inches of base material, or 6.0 inches of Portland cement concrete.

The attached report was prepared based on project and site data available at this time and was prepared in a manner and to the standards of the local geotechnical engineering practice. Our services did not include evaluations for the presence of hazardous materials; for corrosion potential with respect to site soils, for concrete durability and corrosion potential with respect to site use water sources; for area subsidence resulting from groundwater withdrawal; or for other geologic hazards.

If you have any questions, please do not hesitate to call.

Respectfully submitted,
RICKER • ATKINSON • McBEE • MORMAN & ASSOCIATES, INC.





By: Demetrius L. Rugley, P.E.

Reviewed By: David A. Thomas, P.E

/dlr

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REPORT



R·A·M·M

INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed Goodyear Sports Complex, to be located in Goodyear, Arizona. The scope of our services included performing a field exploration program, laboratory analysis and geotechnical engineering evaluation, analysis, and recommendations. The geotechnical recommendations presented herein consist of foundation design, site development, material suitability and requirements, pavement thicknesses, and site preparation and grading procedures. We would be pleased to discuss with you any additional recommendations you may require. In addition, we are available to review project specifications and plans for conformance with our recommendations at no charge to you.

This firm should be notified for additional evaluation and recommendations once the building and structure design parameters (locations, types, sizes, structural loads) have been established, and/or where the site use or conditions encountered during construction differ from those presented herein.

PROPOSED CONSTRUCTION

As presently planned, the proposed project will at least consist of lightly loaded structures such as restrooms, shade structures, CMU walls, light poles and adjacent paved parking and drives constructed within existing retention basins. It is anticipated that maximum structural loads for the structures will be up to 4 kips per linear foot for bearing walls and 30 kips for individual columns.

SITE CONDITIONS

The site of the proposed Goodyear Sports Complex is located at the northwest and northeast corners of I-10 and Litchfield Road in Goodyear, Arizona. At the time of our investigation, the site consisted of four (two on each side of Litchfield Road) retention basins. The two retention basins were located on the west and east sides of Litchfield Road, immediately to the north of I-10. The retention basins were lower in elevation than the surrounding areas and had concrete-lined drainage features located along the perimeters of the retention basins. There were also four culverts within the retention basins. Two were located in the northeastern portion of the eastern basin, along the northern perimeter of the basin, and two were located in the southwestern corner of the western basin. It appears that the retention basins collect runoff from both existing developments located immediately to the north and possibly from I-10. Vegetative cover of the retention basins consisted

of sparse to moderate growths of grasses and scattered shrubs in the western portion of the eastern retention basin.

FIELD EXPLORATIONS

Subsurface conditions at the site were explored by drilling a total of six test borings to a depth of 11.0 feet and two preliminary down-hole percolation tests (P1 and P2) to a depth of 4.0 feet in the proposed new development areas, as shown on the Site Plan in Appendix A. The test borings were advanced with a CME 55 drill rig using 7-inch diameter, hollow-stem auger. The drilling equipment and crew were provided by Wildcat Drilling, Inc. The test boring locations were determined in the field by a geotechnical technician from our firm. During the field exploration, representative disturbed and undisturbed samples were obtained, the test borings logged, and soils field classified by our geotechnical technician, who also directed the drill crew. The relatively undisturbed samples were obtained by driving a 3-inch diameter, ring-lined, open-end sampler into the soil with a 140-pound hammer dropping 30 inches. The results of the field explorations are presented on the Test Boring Logs in Appendix A.

The preliminary percolation test holes were drilled in the center of each retention basin with a CME 55 drill rig using a 12-inch diameter, solid-stem auger. The percolation test holes were presoaked. After presoaking, the percolation test holes were filled with water and the time for the water to fall one inch was recorded. The holes were refilled and the process was repeated until a stabilized percolation rate was obtained. After presoaking each test hole, the following stabilized percolation rates were measured:

Location	Stabilized Percolation Rate
Test Boring P1	5 minutes per inch
Test Boring P2	5 minutes per inch

The stabilized percolation rates measured at the time of our field exploration/percolation testing are based on undisturbed soils at the depths and locations indicated. The percolation rates of retention basins after construction may vary significantly due to such factors as location and depth relative to the percolation tests conducted at the time of our field exploration, type of cover in retention basin bottoms (grass, rock, etc.), degree of compaction of the retention basin bottoms, placement of fill in the retention basins and the amount and type of sediment load deposited in the basins during storm events. The stabilized percolation rates presented above have not been de-rated.

LABORATORY ANALYSIS

Representative samples obtained during the field exploration were subjected to the following laboratory tests.

Type of Test	Type of Sample	Number of Samples Tested
Compression	Undisturbed	2
Minus No. 200 Sieve and Atterberg Limits	Representative	4
Percent Swell	Remolded	2
Soluble Sulfates and Chlorides *	Representative	2
Agronomy *	Representative	2
Moisture Content/Dry Density **	Undisturbed	18

* Conducted by Motzz Laboratory, Inc.
** Reported in the Test Boring Logs

The results of the laboratory tests are presented in Appendix B.

SUBSURFACE CONDITIONS

The surface and subsurface conditions encountered at the test boring locations were variable. The results of the test borings are presented in Appendix A in the Test Boring Logs. In general, the surface and near surface soils encountered in the western retention basin (Test Borings 1, 2 and 3) and extending to a depth of 11.0 feet (maximum depth of exploration) consisted of medium dense to dense silty sand with a trace to some gravel and non-plastic fines. The soils in Test Borings 1 and 2 were interbedded with sandy silt layers below a depth of 4.0 feet. The surface and near surface soils encountered in the eastern retention basin (Test Borings 4, 5 and 6) and extending to a depth of 3.5 feet consisted of stiff to very stiff, low to medium plasticity sandy clay with a trace amount of gravel and light cementation. Underlying these soils and extending to a depth of 11.0 feet (maximum depth of exploration), site soils consisted of medium dense silty sand with a trace amount of gravel and non-plastic fines. Soil moisture contents were described as slightly damp to damp throughout the test borings with an exception in Test Boring 1 where soil moisture contents were described as very damp. No groundwater was observed in the test borings during the drilling and sampling operations.

DISCUSSIONS OF TEST RESULTS

Remolded samples of the surface soils from the site exhibited low swell potentials following wetting when tested in the laboratory. Undisturbed samples from anticipated shallow foundation grades were found to undergo slight compression during loading to approximate foundation loads.

Upon wetting at approximate foundation loads these soils underwent a slight amount to little additional settlement.

FOUNDATION DESIGN RECOMMENDATIONS

Spread Footings:

The proposed buildings can be supported on shallow spread footings, supported on undisturbed site soils and/or compacted fill. Footings thus founded may be designed using an allowable bearing pressure of 2000 psf provided the bottom of the footings are at least 2.0 feet below finished grade. Finished grade is defined as the lowest adjacent finished grade within 5 feet of the perimeter of the building for perimeter footings and as finish floor elevation for interior footings. Structural loads should not exceed 6 kips per linear foot for walls and 60 kips for columns. All foundation excavations should be inspected by a representative of the geotechnical engineer prior to placing reinforcing steel or concrete, to verify and approve bearing conditions. Where foundations have to be deepened to achieve acceptable bearing conditions, the excavations should be backfilled to original bottom of footing level as directed by the geotechnical engineer.

Drilled Pier Footings:

The following recommendations assume that small-diameter drilled pier foundations will be used to support the new canopy for the proposed vehicle wash station. Drilled pier foundations should bear on undisturbed native site soils at a minimum depth of 5.0 feet below lowest adjacent grades. Footings thus founded may be designed using an allowable end bearing pressure of 3500 psf. Structural loads for drilled pier foundations should not exceed 60 kips for columns. All drilled pier footing excavations should be observed by a representative of this firm prior to placing reinforcing steel or concrete, to verify and approve the bearing conditions.

General:

The allowable bearing capacities should be applied to maximum, design dead plus live loads and may be increased by one-third when considering temporary loads such as transient wind or seismic loads. A one-third increase may also be used for toe pressures due to eccentric or lateral loadings, assuming the entire footing bearing surface remains in compression. The weight of the footing concrete below grade may be neglected in dead load computations. The recommended minimum footing widths are 2.0 and 1.33 feet for isolated columns and continuous wall footings, respectively. A Site Class designation of D should be used for the site, per the 2015, 2018 and

2021 International Building Code (IBC). The site class designation is based on our understanding of the soil conditions in the site vicinity and a review of available well holes within the general vicinity of the site. This data was available on ADWR's website and indicates that stiff material with a minimum shear velocity at 600 feet per second exists to depths over 100 feet in the general vicinity of the site.

The estimated total and differential footing settlements for the loading conditions described above are less than ½ inch if soils below footing level remain at or below the construction moisture content. Additional post-construction, differential settlement of equal magnitude could occur if bearing soils become wet after construction. Therefore, continuous footings and stem walls should be reinforced and masonry walls constructed with properly designed reinforcement and with frequent expansion/contraction joints. Positive drainage away from the perimeter of the structures is essential to minimize the potential for moisture infiltration into bearing soils. Any long-term saturation of the bearing soils could result in damaging differential settlements.

Lateral Earth Pressures:

The following tabulation presents the recommended lateral earth pressures and base friction values which should be used in the lateral design of footings and retaining walls. The lateral pressures are equivalent fluid pressures for average anticipated conditions.

Backfill Pressures:
- Unrestrained walls---------- 35 psf/ft
- Restrained walls ---------- 55 psf/ft

Passive Pressures:
- Continuous ----------250 psf/ft
- Isolated column footings ----------250 psf/ft
- Drilled pier footings (upper 5 feet) ----------250 psf/ft
- Drilled pier footings (5 feet and deeper) ----------350 psf/ft

Coefficient of Base Friction:
- Concrete to soil ---------- 0.45
- Plastic membrane to soil---------- 0.25

The above equivalent fluid pressures are for vertical walls with horizontal backfills and do not include temporary loads imposed by compaction equipment or permanent loads resulting from backfill swell pressures, hydrostatic pressures, or surcharge loads. Any retaining walls should contain weep holes to reduce the potential for the buildup of hydrostatic pressures.

SITE DEVELOPMENT RECOMMENDATIONS

Concrete Slab-On-Grade Support:

The near surface soils are non-plastic to medium in plasticity and exhibit low swell potentials when compacted and wetted. These soils will provide adequate support for concrete slabs-on-grade. Interior slabs should be founded on a minimum 4-inch thickness of base material. Exterior slabs should be founded on a prepared subgrade. All unreinforced slabs-on-grade should be jointed in accordance with ACI (American Concrete Institute) or PCA (Portland Cement Association) guidelines.

Surface Drainage:

Most soils will undergo some degree of volume change as the result of wetting. The degree of volume change will depend on the type of soil, swell potential, natural soils structure or degree of compaction (if a fill). These volume changes could result in movements in overlying structural and non-structure elements including sidewalks, planters, retaining walls, etc. Therefore, good site and surface drainage away from these elements is required. In addition, water should not be allowed to pond within 10 feet of the structures and canopy columns or other elements which are sensitive to movements. The exterior footing excavation backfill must be well compacted to minimize the possibility of moisture infiltration through this zone.

Excavatability:

The excavatability of site materials is difficult to evaluate based only on the exploration equipment used during this design report. Therefore, we recommend that the contractor evaluate the excavatability of site materials by performing test excavations with the size and type of equipment the contractor plans on using at the site. For design purposes the following paragraph presents our best analysis as to the excavatability of site soils.

The near surface and underlying soils to a depth of 11 feet can probably be removed with conventional excavating and drilling equipment. The excavations will be slower and more difficult with depth within the silty sand soils due to caving. OSHA requires all excavations over five feet in depth, in which personnel are to enter, be either braced or sloped in accordance with OSHA regulations.

Workability:

Wetting site soils such that moisture contents are at or above optimum could result in some soil pumping under dynamic loadings such as heavy construction equipment driving over the area. In the structure areas, some pumping is not detrimental to foundation or floor slabs provided the specified percent compaction is achieved. However, in flexible pavement areas where pumping has occurred, and in structure areas where severe pumping has damaged subgrade conditions, the area should be allowed to dry until soils are workable without pumping or the wetted areas removed and replaced with drier site soils.

Concrete Durability:

As part of this investigation, Soluble Sulfates and Chlorides testing of site soils was conducted. The results of the laboratory testing are included in Appendix B. Based on our laboratory test results and the 2021 IBC Concrete Durability Requirements, Section 1904, there appears to be a low potential for deterioration to concrete in contact with site soils. This potential is a function of soil type and moisture content, material type and/or composition, water chemistry and other factors. Accordingly, the results of the laboratory testing should be made available to material suppliers and concrete experts for review.

PAVEMENT DESIGN RECOMMENDATIONS

Asphalt Concrete:

The following asphalt concrete pavement sections are based on anticipated traffic types and frequencies, site soil conditions and a 20-year design life. Therefore, any material imported to the site and placed in pavement areas should have support characteristics the same as or better than the site soils.

	Pavement Section	
Area of Use	Asphalt Concrete	Base Material
Automobile Parking Areas and Drives	2.0 inches	5.0 inches
Truck Drives and Fire Lanes	3.0 inches	6.0 inches

These sections are minimal and will require periodic maintenance (seal coats, overlays or patching) where proper drainage is provided and maintained. Should moisture penetrate to the subgrade soils or ponding occur on or adjacent to the pavement sections, a significant reduction in pavement life could occur along with increased maintenance. Therefore, good surface drainage on and adjacent to the pavement is essential to achieving the desired pavement life.

Portland Cement Concrete:

The following Portland cement concrete pavement (PCCP) sections are based on anticipated vehicle types, traffic frequencies and site soil conditions. Any material imported to the site and placed in pavement areas should have support characteristics the same as or better than the site soils.

Area of Use	PCCP Section
Automobile Parking and Drives	5.0 inches
Truck Drives and Fire Lanes	6.0 inches

Base material is not required below the PCC pavement sections; however, if construction occurs during the summer months the base material would help reduce the potential for slab curling and shrinkage cracking. A maximum joint spacing of 12 to 15 feet should not be exceeded in either direction and all joints should be designed to provide load transfer. Joint detail, joint layout and concrete batching, placing, curing and observation procedures should be in accordance with the recommendations developed by the Portland Cement Association.

MATERIALS SUITABILITY AND REQUIREMENTS

Site Soils:

The surface and near surface soils are non-plastic to medium in plasticity and have low swell potentials when compacted and wetted. The site soils may be used as fill in all areas of the site. All materials should be free of organics, debris, rubble and material greater than 6 inches in size.

Imported Soils:

Fill required beyond that available from site sources and used as fill or backfill in the new improvement areas, or for use as retaining wall backfills, should be imported soils meeting the following requirements:

Minimum Passing #4 Sieve ---------- 30%
Maximum Particle Size ---------- 3 inches
Maximum Swell Potential ---------- 1.5%*

* Based on a sample which is remolded to 95% of the ASTM D698 maximum dry density at a moisture content of 2 percent below optimum, placed under a surcharge load of 100 psf and wetted.

Imported soils should have a low corrosion potential as determined by a corrosion expert and/or material supplier and should meet ACI 318 negligible sulfate exposure durability requirements for concrete.

Base Material:

Base material used below concrete slabs and pavements should conform to the requirements of Maricopa Association of Governments (MAG) Specifications for Aggregate Base (Section 702).

Asphalt Concrete Pavement:

Asphalt concrete pavement materials should conform to the requirement of MAG Specifications for asphalt concrete (Section 710).

Portland Cement Concrete Pavement:

The Portland cement concrete pavement should have a minimum compressive strength of 4000 psi at 28 days and a maximum slump of 4 inches at the time of placement. The PCCP should conform to the requirements of MAG Specifications for Portland Cement Concrete (Section 725, Class AA).

SITE PREPARATION AND GRADING PROCEDURES

Building, Canopy, and Pavement Areas:

Recommendations presented in the previous sections of this report are based upon the following site preparation and grading procedures. Therefore, all earthwork should be accomplished with observation and testing by a qualified technician under the direction of a registered geotechnical/ materials engineer. The following apply to the areas within and extending 5 feet beyond the footprint of the structures, and in exterior slab and pavement areas.

1. Clear and grub the site by removing and disposing of all vegetation in areas to be developed, all debris and rubble, and remnants of former developments.
2. Strip the site of all existing fill zones, any backfill zones and any unstable soils. During stripping observe the surface for evidence of buried debris, vegetation or disturbed materials which will require additional removal. Areas steeper than 5H to 1V should be benched and any depressions widened to accommodate compaction equipment.

3. Prepare the ground surface in at-grade areas, in fill areas and in areas cut to grade by scarifying, moisture conditioning and compacting the exposed surface soils to a depth of 10 inches.

4. Moisture condition and place all fill and backfill materials required to achieve specified grades. Fill materials should be moisture conditioned, placed and compacted in horizontal lifts of thicknesses compatible with the compaction equipment being used.

5. Compact subgrade, fill, backfill, subbase fill or base material to the following minimum percent compaction of the ASTM D698 maximum dry density for each lift.

Material	Minimum Percent Compaction
Soil:	
Below foundations	95
Below pavement sections	95
Below concrete floor slabs (above footings)	90
Below exterior concrete slabs	90
Base Material:	
Below concrete slabs	95
Below pavement sections	100
Backfill: *	90

* Outside of building, structure, exterior slab and pavement areas.

6. The moisture content of soil and base materials at the time of compaction should be:

Type	Area of Use	Moisture Content
On-Site	Structures, Exterior Slabs	Optimum plus or minus 3%
On-Site	Pavements	2% below optimum or lower
Imported	Structures, Exterior Slabs	Optimum plus or minus 3%
Imported	Pavements	2% below optimum or lower
Base Material	Structures and Pavements	Optimum plus or minus 3%

7. Any soils which are disturbed or overexcavated by the contractor outside the limits of the plans or specifications should be replaced with materials compacted as specified above. The above compaction requirements will also apply to any disturbance occurring within the construction limits, including but not limited to backfilling of trenches inside and outside of the new improvement areas.

LIMITATIONS

This report is an instrument of service of Ricker, Atkinson, McBee, Morman & Associates, Inc. (RAMM). The report has been prepared for the exclusive use of *J2 Engineering and Environmental Design and their assignees* for the specific application to the *Goodyear Sports Complex Feasibility Study*. RAMM has employed commonly accepted geotechnical engineering procedures, and our opinions and conclusions are made in accordance with generally accepted principles and practices of these professions common to the local area.

The contents of this report are valid as of the date of preparation. However, changes in the condition of the site can occur over time as a result of either natural processes or human activity. In addition, advancements in the practice of geotechnical engineering, engineering geology and hydrogeology and changes in applicable practice codes may affect the validity of this report. The report's contents may not be relied upon by any other party without the express written permission of RAMM.

Although not anticipated at this site, we should note that our investigation did not include the evaluation or assessment of any potential environmental hazards or groundwater contamination that may be present. RAMM makes no warranty, either expressed or implied.

APPENDIX A
FIELD EXPLORATIONS



N

LEGEND

- Test Boring Location
- Percolation Test Location

JOB NO.	G29478
LOCATION	Goodyear
DATE	1/11/2021
PAGE	A1

Goodyear Sports Complex Fesibility Study

I-10 and Litchfield Road

Testing Locations

RICKER · ATKINSON · McBEE · MORMAN & ASSOC., INC.

2105 South Hardy Drive, Suite 13, Tempe, AZ 85282-1924

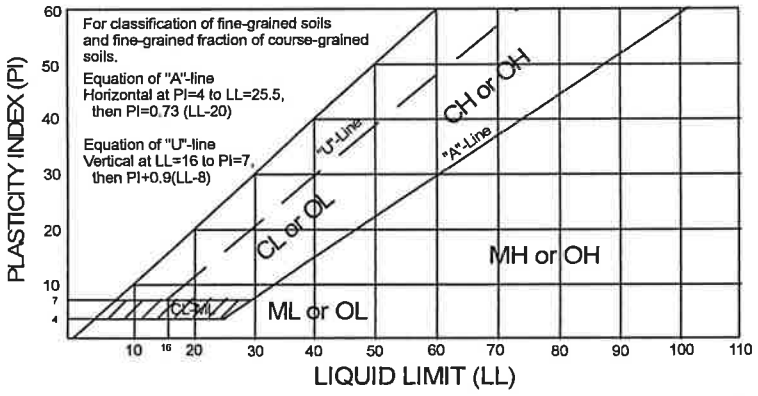
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LEGEND

CLASSIFICATION OF SOILS

ASTM Designation: D2487-11
(Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests					Soil Classification: Group Symbol	Soil Classification: Name
COARSE-GRAINED SOILS More than 50% retained on No. 200 Sieve	Gravels More than 50% coarse fraction retained on No. 4 Sieve	Clean Gravels Less than 5% fines	Cu >4 and 1 <Cc <3		GW	Well graded gravel
			Cu<4 and/or 1>Cc>3		GP	Poorly graded gravel
		Gravels with Fines More than 12% fines	Fines classify as ML or MH		GM	Silty gravel
			Fines classify as CL or CH		GC	Clayey gravel
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	Cu >6 and 1 <Cc <3		SW	Well-graded sand
			Cu<6 and/or 1>Cc>3		SP	Poorly graded sand
		Sands with Fines More than 12% fines	Fines classify as ML or MH		SM	Silty sand
			Fines classify as CL or CH		SC	Clayey sand
FINE-GRAINED SOILS 50% or more passes the No. 200 Sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI>7 and plots on or above "A" line		CL	Lean clay
			PI<4 or plots below "A" line		ML	Silt
		Organic	Liquid Limit - oven dried / Liquid limit - not dried	<0.75	OL	Organic clay / Organic silt
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line		CH	Fat clay
			PI plots below "A" line		MH	Elastic silt
		Organic	Liquid limit - oven dried / Liquid limit - not dried	<0.75	OH	Organic clay / Organic silt
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor				PT	Peat



TEST BORING LOG DEFINITIONS

Blows per foot using 140 pound hammer with 30 inch free-fall.

Depth, feet	Blows/Foot: C	Blows/Foot: N/R	Sample Type	Dry Density pcf	Water Content %	Unified Classification	Description

C = Continuous Penetration Resistance (2 inch diameter rod)
N = Standard Penetration Resistance (ASTM D1586)
R = Penetration Resistance (3 inch diameter ring line sampler)

GRAIN SIZES

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

SILTS & CLAYS DISTINGUISHED ON BASIS OF PLASTICITY	SAND			GRAVEL			COBBLES	BOULDERS
200	40	10	4	3/4"		3"	12"	
	FINE	MEDIUM	COARSE	FINE	COARSE			

MOISTURE CONDITION (INCREASING MOISTURE →)

DRY — SLIGHTLY DAMP — DAMP — MOIST (Plastic Limit) — VERY MOIST — WET (SATURATED) (Liquid Limit)

CONSISTENCY CORRELATION		RELATIVE DENSITY CORRELATION	
CLAYS & SILTS	BLOWS/FOOT*	SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	VERY LOOSE	0-4
SOFT	2-4	LOOSE	4-10
FIRM	4-8	MEDIUM DENSE	10-30
STIFF	8-16	DENSE	30-50
VERY STIFF	16-32	VERY DENSE	OVER 50
HARD	OVER 32		

*Number of blows of 140 lb hammer falling 30" to drive a 2" O.D. (1-3/8" I.D.) split-spoon sampler (ASTM D1586).

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 1

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
						SM	Silty Sand, Some Gravel; brown, very damp, medium dense, non-plastic.
		50/10"	R	84	15		
5		50/11"	R	93	15		Interbedded with sandy silt layers below 4.0 feet.
10		43	R	104	16		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 2

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		50/8"	R	105	4	SM	Silty Sand, Trace to Some Gravel; brown, slightly damp to damp, medium dense, non-plastic.
5		30	R	104	4		Interbedded with sandy silt layers below 4.0 feet.
10		50/8"	R	100	9		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 3

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		26	R	104	2	SM	Silty Sand, Trace to Some Gravel; brown, slightly damp to damp, medium dense to dense, non-plastic.
5		50/12"	R	119	3		
10		50/2"	R	119	6		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 4

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		41	R	88	6	CL	Sandy Clay, Trace Gravel; brown, slightly damp, stiff to very stiff, low to medium plasticity, light cementation.
5		14	R	105	1	SM	Silty Sand, Trace to Some Gravel; brown, slightly damp to damp, medium dense, non-plastic.
10		42	R	120	5		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 5

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		25	R	110	3	CL	Sandy Clay, Trace Gravel; brown, slightly damp, stiff to very stiff, low to medium plasticity, light cementation.
5		34	R	117	3	SM	Silty Sand, Trace to Some Gravel; brown, slightly damp to damp, medium dense, non-plastic.
10		21	R	104	3		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

TEST BORING LOG

Project: Goodyear Sports Complex, Goodyear, Arizona Test Boring: 6

Elevation: Not Determined Datum: --- Date: 11/9/23

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		37	R	106	4	CL	Sandy Clay, Trace Gravel; brown, slightly damp, stiff to very stiff, low to medium plasticity, light cememtation.
5		49	R	108	7	SM	Silty Sand, Trace to Some Gravel; brown, slightly damp to damp, medium dense, non-plastic.
10		20	R	109	2		
							Stopped drilling at 11.0 feet. No groundwater observed.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

APPENDIX B
LABORATORY ANALYSIS

LABORATORY TEST RESULTS

Date: 18-Dec-23

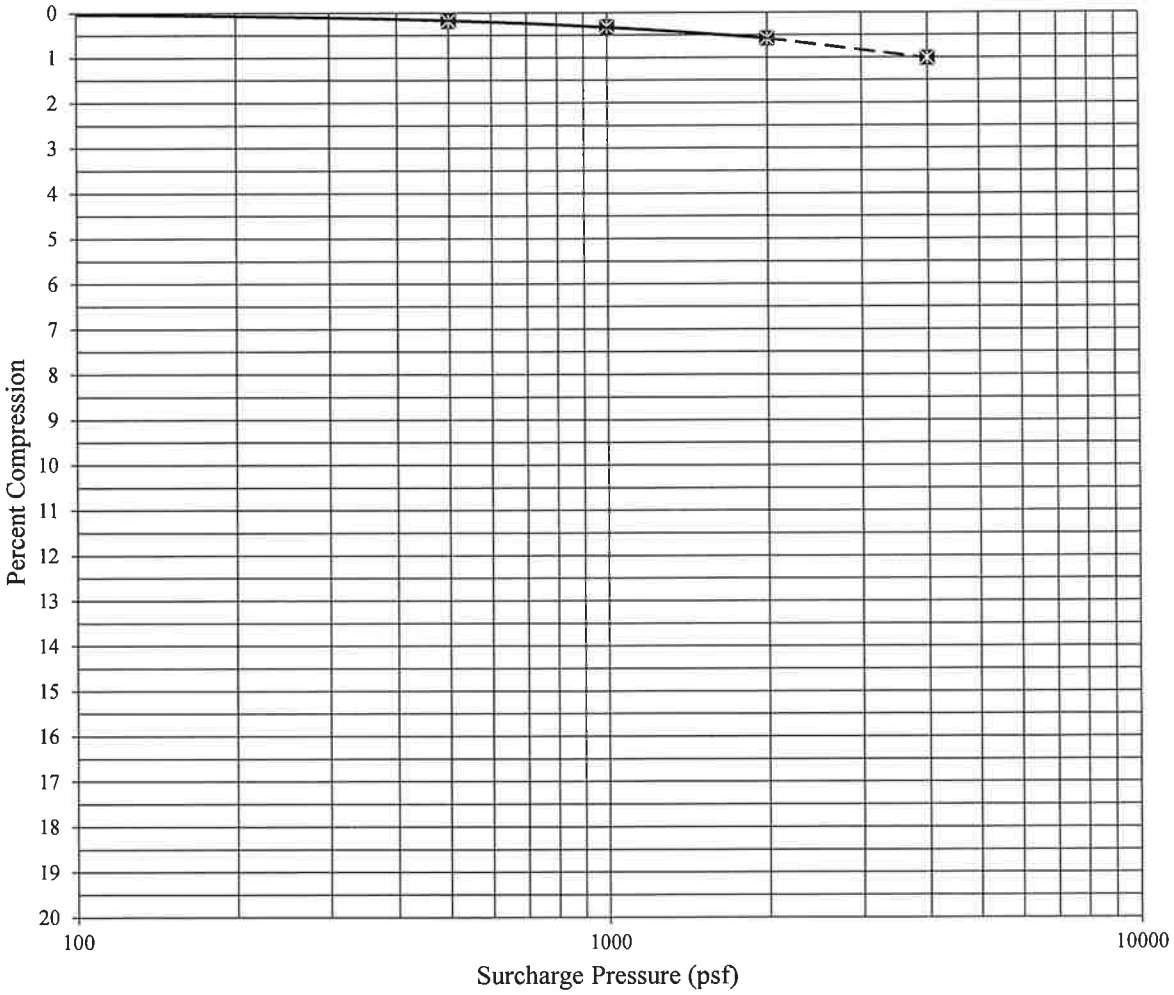
SAMPLE SOURCE: 1 @ 1.5'-2.5'

TESTING PERFORMED: Compression (ASTM D2435) - Driven Ring Sample

SAMPLED BY: RAMM/Olson

RESULTS:

Dry Density (pcf): 84 Moisture Content (%): 15



REMARKS: Sample submerged at 2000 psf.

LABORATORY TEST RESULTS

Date: 18-Dec-23

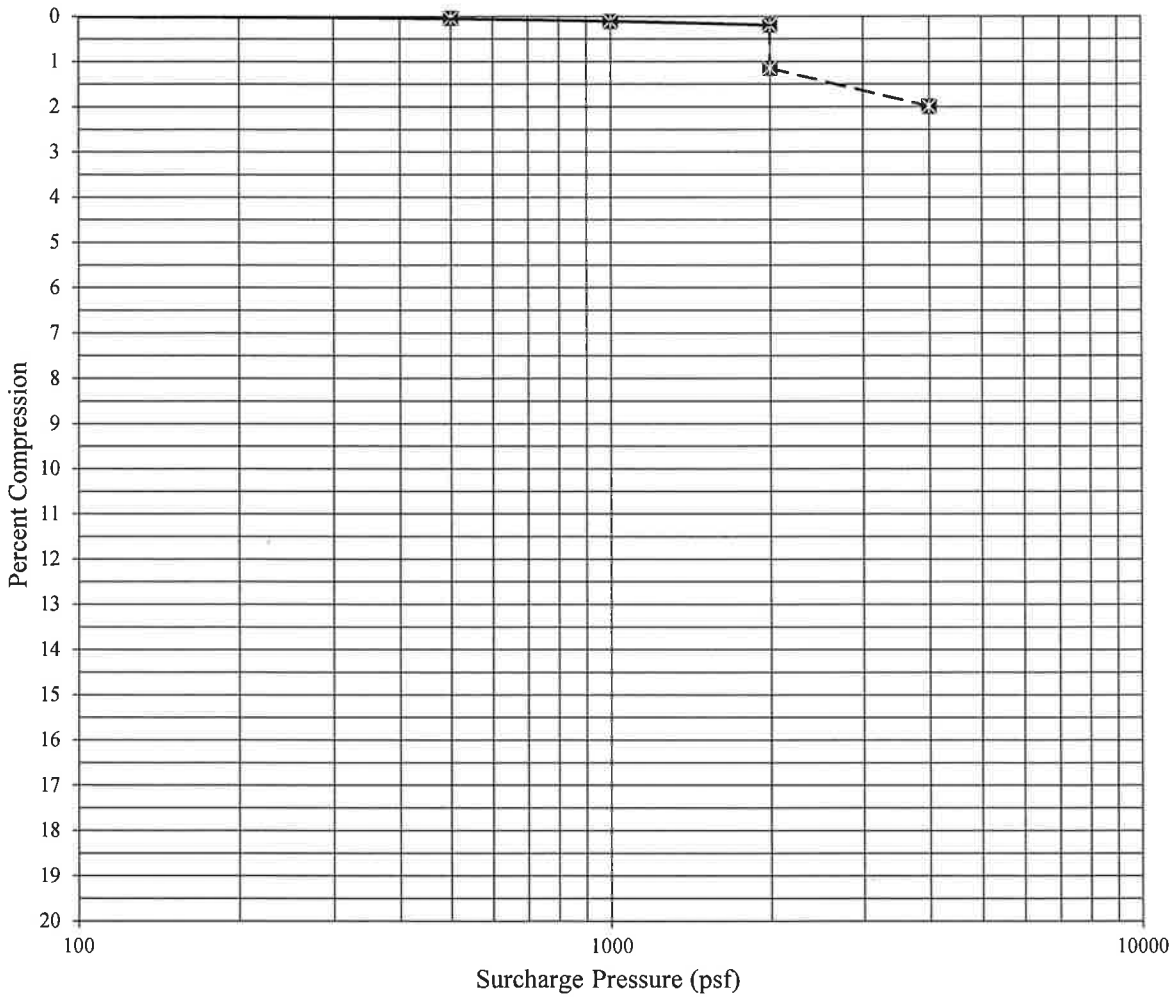
SAMPLE SOURCE: 5 @ 1.5'-2.5'

TESTING PERFORMED: Compression (ASTM D2435) - Driven Ring Sample

SAMPLED BY: RAMM/Olson

RESULTS:

Dry Density (pcf): 110 Moisture Content (%): 3



REMARKS: Sample submerged at 2000 psf.

LABORATORY TEST RESULTS

Date: 18-Dec-23

SAMPLE SOURCE: As noted below

TESTING PERFORMED: Percent Passing No. 200 Sieve, Atterberg Limits, Percent Expansion (ASTM D1140, D4318, D4546)

SAMPLED BY: RAMM/Olson

RESULTS:

Sample Source	Percent Retained No. 4 Sieve	Percent Passing No. 200 Sieve	Liquid Limit	Plasticity Index	Percent Expansion*	Remolded Dry Density (pcf)	Remolded Moisture Content (%)
1 @ 0'-3'	18	39	N/A	NP			
3 @ 0'-3'	5	19	N/A	NP	0.1	118	9
5 @ 0'-3'	2	61	44	9	0.6	78	27
6 @ 0'-3'	8	59	28	8			

* Based upon sample remolded to 95% of the estimated maximum dry density at 2% below the estimated optimum moisture content, with a surcharge pressure of 100 psf.

MOTZZ LABORATORY, INC.

Report: 948748
Reported: 11/18/2023
Received: 11/13/2023
PO: G29478

Laboratory Analysis Report

Ricker-Atkinson-McBee-Morman
Shawn Morman
2105 South Hardy Drive, Suite 13
Tempe, AZ 85282-1924

Project: G29478

Lab Number	Sample ID
948748-1	5 (0-3')

Test Parameter

Test	*Method*	*Result*	*Units*
Sulfate	ARIZ 733b	11	ppm
Chloride	ARIZ 736b	42	ppm

Sulfate 0.0011%; Chloride 0.0042%

Lab Number	Sample ID
948748-2	3 (0-3')

Test Parameter

Test	*Method*	*Result*	*Units*
Sulfate	ARIZ 733b	4	ppm
Chloride	ARIZ 736b	23	ppm

Sulfate 0.0004%; Chloride 0.0023%

APPENDIX C
SOIL TESTING
AND
AGRONOMY RECOMMENDATIONS



R·A·M·M

MOTZZ LABORATORY, INC.

Report: 948748
Reported: 11/18/2023
Received: 11/13/2023
PO: G29478

Laboratory Analysis Report

Ricker-Atkinson-McBee-Morman
Shawn Morman
2105 South Hardy Drive, Suite 13
Tempe, AZ 85282-1924

Project: G29478

Lab Number	Sample ID	Crop Info
948748-3	5 (0-3')	Landscape

Soil Complete Test

Test	*Method*	*Result*	*Units*	*Levels*
pH	1:1	6.7	SU	Medium
Electrical Conductivity, EC	1:1	0.66	dS/m	Medium
Calcium, Ca	NH4OAc (pH 8.5)	2,800	ppm	High
Magnesium, Mg	NH4OAc (pH 8.5)	270	ppm	Very High
Sodium, Na	NH4OAc (pH 8.5)	87	ppm	Medium
Potassium, K	NH4OAc (pH 8.5)	360	ppm	High
Zinc, Zn	DTPA	83	ppm	Very High
Iron, Fe	DTPA	62	ppm	Very High
Manganese, Mn	DTPA	11	ppm	High
Copper, Cu	DTPA	160	ppm	Very High
Nickel, Ni	DTPA	49	ppm	
Nitrate-N, NO3-N	Cd-Reduction	55	ppm	Very High
Phosphate-P, PO4-P	Olsen	330	ppm	Very High
Sulfate-S, SO4-S	Hot Water	28	ppm	High
Boron, B	Hot Water	0.93	ppm	Medium
Free Lime, FL	Acid Test	High		
ESP	Calculated	2.2	%	
CEC	Calculated	17.5	meq/100g	

MOTZZ LABORATORY, INC.

Report: 948748
Reported: 11/18/2023
Received: 11/13/2023
PO: G29478

Laboratory Analysis Report

Ricker-Atkinson-McBee-Morman
Shawn Morman
2105 South Hardy Drive, Suite 13
Tempe, AZ 85282-1924

Project: G29478

Lab Number	Sample ID	Crop Info
948748-4	3 (0-3')	Landscape

Soil Complete Test

Test	*Method*	*Result*	*Units*	*Levels*
pH	1:1	8.4	SU	Very High
Electrical Conductivity, EC	1:1	1.0	dS/m	Medium
Calcium, Ca	NH4OAc (pH 8.5)	3,400	ppm	Very High
Magnesium, Mg	NH4OAc (pH 8.5)	650	ppm	Very High
Sodium, Na	NH4OAc (pH 8.5)	480	ppm	Very High
Potassium, K	NH4OAc (pH 8.5)	230	ppm	Medium
Zinc, Zn	DTPA	0.35	ppm	Low
Iron, Fe	DTPA	11	ppm	High
Manganese, Mn	DTPA	8.7	ppm	High
Copper, Cu	DTPA	1.0	ppm	High
Nickel, Ni	DTPA	0.12	ppm	
Nitrate-N, NO3-N	Cd-Reduction	20	ppm	Medium
Phosphate-P, PO4-P	Olsen	7.4	ppm	Low
Sulfate-S, SO4-S	Hot Water	93	ppm	Very High
Boron, B	Hot Water	2.2	ppm	High
Free Lime, FL	Acid Test	High		
ESP	Calculated	8.3	%	
CEC	Calculated	25.0	meq/100g	

Victoria Normandin, LLC
Email: vicn@cox.net
602-799-7248

Date: 11/22/2023
Report: 948748
Information provided by the laboratory: Landscape

Sample 5, 948748-3
The pH of the soil is in a particularly good range at 6.7.
EC is low and no high salt issues are present.

Nitrate-N, Phosphate-P and Potassium are all adequate, or more than adequate.
The Ca:Mg ratio is good at 10:1.

Micronutrients: Fe, Mn and B are adequate or more than adequate. Zinc is extremely high but should not cause detriment to plant growth. Copper is extremely high at 160 ppm, harmful to plant growth and likely toxic for many landscape plants.

Sample 3, 948748-4
The pH of the soil is high at 8.4.
EC or soluble salt is moderate at 1.0 dS/m. Sodium at 480 ppm is very high and Exchangeable Sodium Percentage, %ESP, is high at 8.4%. Till in or topically apply 15 lbs. Sulfur/1000sq.ft to lower pH and assist sodium in leaching. After applying sulfur, leach or move sodium lower in the profile by applying heavy, deep irrigation.

Nitrate-N is moderate at 20 ppm, Phosphate-P is low at 7 ppm and Potassium is adequate.
After leaching, apply 1.5 lbs. N/1000 and 1.5 lbs. P_2O_5/1000 sq.ft.

The Ca:Mg ratio is fine at 5:1.
Micronutrients, Fe, Mn, Cu, B, are adequate and in good proportion to each other.
Zinc is low. Use a blended N-P fertilizer that contains a minor amount of zinc.

Thank you,

Victoria Normandin

Victoria Normandin, CPAg

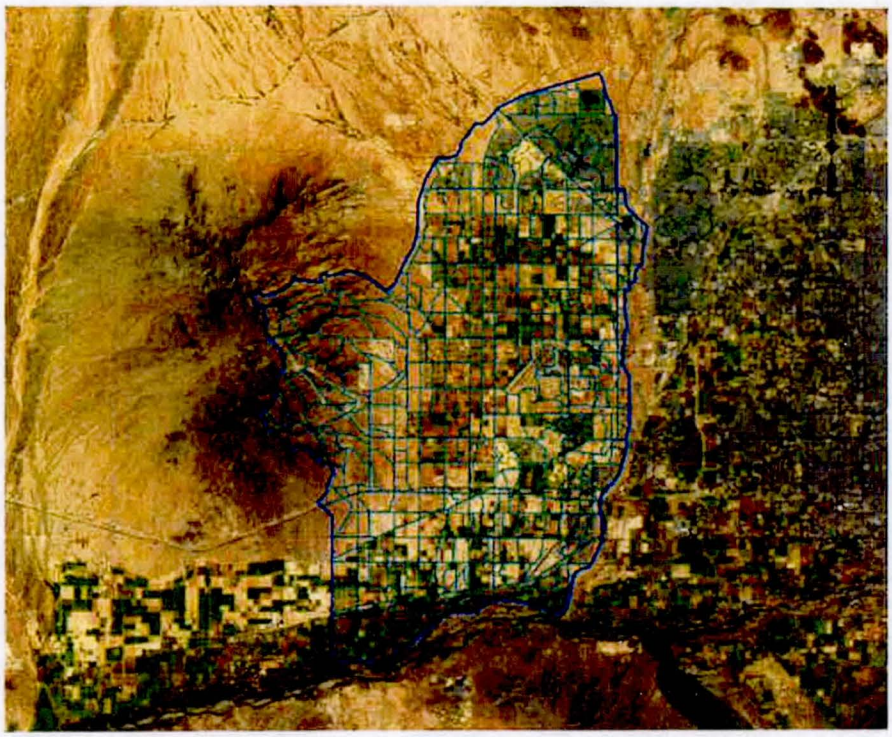
Note: Soil Nutrient interpretations and recommendations are based on the Soil Complete/Standard Analysis Report provided Motzz Laboratory.

Appendix D

2015 FCDMC White Tanks ADMP – Optional ADOT Basins Watershed Report

FCD 2014C003, Assignment #1
Loop 303 Corridor/White Tanks Hydrology and Delineation Update
PHASE 1 – UPDATING THE EXISTING HYDROLOGY MODEL

FINAL HYDROLOGY REPORT



JULY 2015
REVISED AUGUST 2015

Prepared For

Flood Control District of Maricopa County



EXPIRES: 6/30/16

Prepared By

PARSONS BRINCKERHOFF

A470.717

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EXPIRES: 6/30/16

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EXHIBITS

Exhibit 1 HEC-1 Schematic for Existing Conditions with Partially Completed CIP Hydrology (Electronic Copy Only)

Exhibit 2 HEC-1 Schematic for Existing Conditions with CIP In Place Hydrology (Electronic Copy Only)

Exhibit 3 HEC-1 Schematic for Future Conditions with CIP In Place Hydrology (Electronic Copy Only)

NOTE: HEC-1 MODELS and DATA COLLECTION ITEMS are included in Electronic Copy Only.

1.0 INTRODUCTION

Parsons Brinckerhoff (PB) performed this study under Contract FCD 2014C003 with the Flood Control District of Maricopa County (FCDMC). The purpose of this study is to update the hydrology model from the Loop 303 Corridor/White Tanks Area Drainage Master Plan Update (ADMPU) Area Hydrology Analysis (AHA), dated July 10, 2009 (Reference 1). This study is Phase 1 – Updating the Capital Improvement Projects (CIP) in Hydrology Model. The project scope include performing a complete and detailed hydrology model update of the project area to reflect the completion of the Loop 303 from Grand Avenue (US 60) to Interstate 10 (I-10) and the FCDMC's Loop 303 Outfall Drainage System from Woodlands Avenue to Gila River. In addition, the Existing Conditions HEC-1 model will be updated to reflect those CIP projects completed after the completion of ADMPU AHA in 2009 up to 2014. There is also an Optional Task to be performed to the ADOT Basins Watershed regarding the construction of retention basins within the Suncor property locations.

2.0 LOCATION OF STUDY

The study area and watersheds for the ADMPU include 238 square miles in unincorporated Maricopa County, the City of Avondale, the City of Buckeye, the City of El Mirage, the City of Glendale, the City of Goodyear, the City of Litchfield Park, the City of Surprise, and Luke Air Force Base. The study area encompasses the Agua Fria River, Gila River, El Mirage Drain, Sun City Drains, Dysart Drain, Colter Channel, Watson Drain, Beardsley Canal, White Tanks FRS #3, and White Tanks FRS #4. Figure 1 contains a Project Location and Vicinity Map.

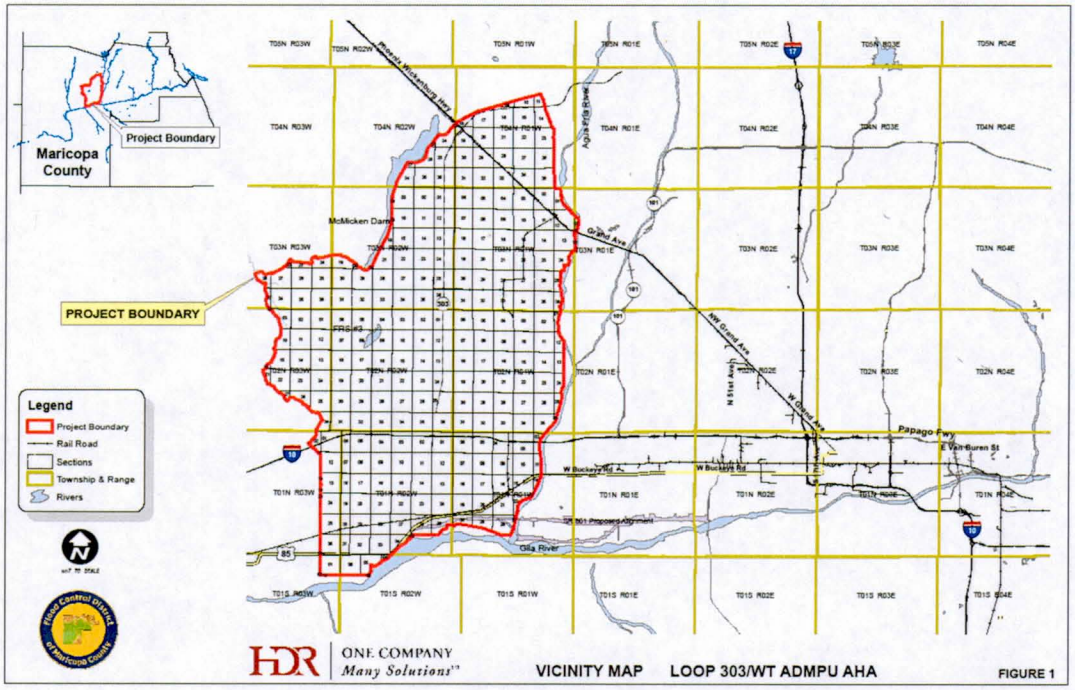


Figure 1: Project Location and Vicinity Map

3.0 HYDROLOGY MODEL UPDATE

PB performed updating existing hydrology models by using the existing hydrology models furnished by FCDMC, collecting as-built plans of the completed Loop 303 and pertinent data, and revising the hydrology models for existing and future conditions based on the existing partially completed CIP and fully completed CIP.

3.1 DATA COLLECTION

PB collected, reviewed and utilized the as-built plans, bid documents, CIP existing conditions, and FCDMC's furnished materials to update the existing hydrology models.

The FCDMC's furnished materials included the following items:

- 2009 ADMPU AHA three hydrology models including Existing Conditions, Existing Conditions with CIP In Place, and Future Conditions with CIP In Place.
- Two FCDMC's Interoffice Memoranda from John Holmes to Amir Motamedi dated October 16, 2009 and February 8, 2010, respectively.
- Figures 7 and 8 of ADMPU AHA including HEC-1 Schematic for Existing Conditions Hydrology and HEC-1 Schematic for Capital Improvement Project Conditions Hydrology.
- 2009 ADMPU AHA CAD and GIS files.

- Aerial photography with orthophotography tiles for FY 07/08 and FY 13/14.
- Inflow Design Flood Hydrology Report for White Tanks Floodwater Retarding Structure No. 4 Rehabilitation Project (FCD 2008C002).
- Northern Parkway Drainage Improvements – AT&SF Channel to Agua Fria River.

Collected as-built plans and bid documents included the following items:

- FCDMC's LOOP 303 OUTFALL DRAINAGE SYSTEM (WOODLANDS AVENUE TO GILA RIVER), PCN 470.14.31, FCD Contract No. 2011C015.
- ADOT's I-10 / SR 303L T.I. (PHASE I), Project No. 303 MA 104 H7139 01C, Federal Aid No. NH-303-A(206)N.
- ADOT's SR 303L, THOMAS ROAD - CAMELBACK ROAD, Project No. 303 MA 105 H7872 01C, Federal Aid No. STP-303-A(201)A.
- ADOT's SR 303L, CAMELBACK ROAD – GLENDALE AVENUE, Project No. 303 MA 107 H7873 01C, Federal Aid No. -303-A(202)A.
- ADOT's SR 303L, GLENDALE AVENUE-PEORIA AVENUE, Project No. 303 MA 109 H7874 01C, Federal Aid No. NH-303-A(203)N.
- ADOT's SR 303L, PEORIA AVENUE – WADDELL ROAD, Project No. 303 MA 112 H7875 01C, Federal Aid No. NH-303-A(204)N.
- ADOT's SR 303L, WADDELL ROAD – MOUNTAIN VIEW BOULEVARD, Project No. 303 MA 114 H7876 01C, Federal Aid No. STP-303-A(205)N.
- ADOT's I-10 FROM BULLARD AVENUE TO DYSART ROAD, Project No. I-IG-10-2(37).

The collected as-built plans and bid documents for this project are not printed, but they are included electronically on a compact disk in this report with other digital data files.

FCDMC has provided a revised Figure 4 – CIP Facilities from ADMPU AHA for Existing Completed CIP Projects. Figure 2 shows the partially completed CIP Facilities Map. A list of the CIP Projects, which have not yet been completed or have been removed, was provided as follows:

- Reems Road Channel between Waddell Road and Cactus Road.
- Waddell Channel (CAR).
- AT&SF Channel between the Northern Parkway Curve and approximately Waddell Road.
- AT&SF Basin.
- Northern Parkway Drainage Improvement (and basin) between Dysart Road and El Mirage Road.
- Northern Channel.
- Luke Air Force Base Improvements.
- Bullard Wash north of Camelback Road.
- I-10 West Diversion Channel from approximately 183rd Avenue to approximately 190th Avenue.

- Bullard Wash Channel (and Basin) between McDowell Road and Lower Buckeye Road.
- Olive Avenue Basin and the East Camelback Basin have been removed from the CIP Plan.

3.2 EXISTING HYDROLOGY MODELS

The existing Hydrology Models from ADMPU AHA were prepared by HDR, Inc. in August 2009. The study area for the ADMPU AHA, approximately 238 square miles in size, has been divided into two major basins (Major Basin 01 and Major Basin 02).

Major Basin 01 consists of drainage sub-basins with milder terrain, while Major Basin 02 consists of White tank Mountain and Foothills. Therefore, the ADMPU AHA has two distinct hydrology models (Major Basin 01 and Major Basin 02) to allow for different hydrologic parameters (Such as precipitation, flow split calculations, etc.).

The scope of work for this project is to update only the Major Basin 01 hydrology models. Therefore, no modifications have been made to the Major Basin 02 hydrology models.

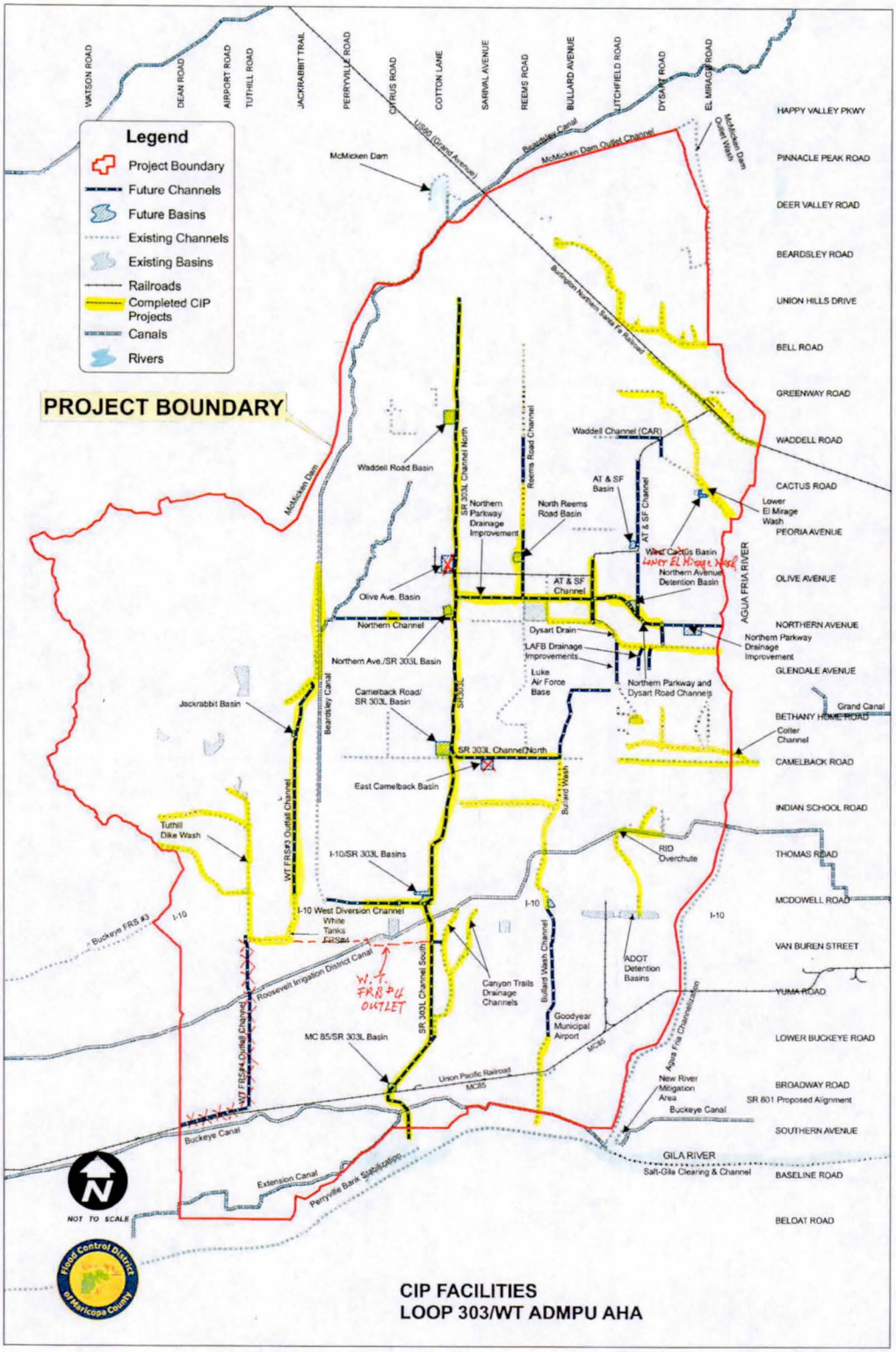


Figure 2: Existing Partially Completed CIP Facilities Map

The ADMPU AHA hydrology models were further updated by Hydrology and Hydraulics Branch of FCDMC in October 2009 and January 2010 with a new HEC-1 model names through each update. Table 1 shows the HEC-1 model names with descriptions.

Table 1: Existing HEC-1 Model Names with Model Descriptions

Description	HEC-1 Name (Used by HDR)	HEC-1 Name (Used by FCDMC)
Existing Conditions	EX-MB1.DAT	WT1E02.DAT
Existing Conditions with CIP in Place	ECIP-MB1.DAT	WT1EC02.DAT
Future Conditions with CIP in Place	FCIP-MB1.DAT	WT1FC02.DAT

3.3 UPDATING HYDROLOGY MODELS

PB used the existing 2010 hydrology models for Major Basin 01 furnished by FCDMC for this study. The U.S. Army Corps of Engineers' HEC-1 computer software program, Version 4.1, June 1998 was used for the hydrological analyses (Reference 2). PB made changes and updated these hydrology models by keeping their same HEC-1 Model names with slightly different descriptions that ADMPU AHA used.

It should be noted that the land use and soil and bedrock maps have not changed from previous iterations of this project, and as such do not need to be updated as a part of this project.

Table 2 presents comparison between FCDMC's 2010 HEC-1 Model names and PB's 2015 updated HEC-1 Model names.

Table 2: Updated HEC-1 Model Names with Model Descriptions

ADMPU AHA Model Description	HEC-1 Model Name (Used by FCDMC)	Updated Model Description	Updated HEC-1 Model Name
Existing Conditions	WT1E02.DAT	Existing Conditions with Partially Completed CIP in Place	WT_EXST.DAT
Existing Conditions with CIP in Place	WT1EC02.DAT	Existing Conditions with CIP in Place	WT_EXCIP.DAT
Future Conditions with CIP in Place	WT1FC02.DAT	Future Conditions with CIP in Place	WT_FUCIP.DAT

Major changes to the existing FCDMC's HEC-1 models for the updated HEC-1 models are summarized as follows:

Olive Avenue Basin and East Camelback Basin Elimination

The Olive Avenue Basin located at west of the SR303L between Peoria Avenue and Olive Avenue has been eliminated. East Camelback Basin (it was called Reems Road Basin in the FCDMC's HEC-1 models) located at south of Camelback Road between Sarival Avenue and Reems Road has been eliminated. These two basins were removed from the updated HEC-1 models.

Prasada Development Considerations

The Prasada development, which will retain only the first flush volumes (first 0.5 inch runoff), has been reflected in the updated HEC-1 models. Two sub-basins were changed in the HEC-1 models including Sub-Basin L13 (bounded by Greenway Road on the north, SR303L on the east, Cotton Lane on the west, and Waddell Road on the south) and Sub-Basin L19 (bounded by Waddell Road on the north, SR303L on the east, Cotton Lane on the west, and Cactus Road on the south) to reflect the proposed Prasada development. The Sub-Basin L13 is divided into two Sub-Basins (L13A and L13B) based on the Prasada Development Drainage Report. Impervious areas for these Sub-Basins (L13A, L13B, and L19) are set at 80% per ADOT's direction. On-Site retention requirements for these three sub-basins are first flush volumes only instead of the 100-year 2-hour retention requirements.

Changes to Detention Basins

Waddell Road Basin, Northern Avenue Basin, and Camelback Road Basin have been changed to from off-line basins to in-line basins. Basin storage routing data (SQ, SV, and SE records) were estimated based on the SR303L as-built plans.

No Diversion to the East along Camelback Road

FCDMC's HEC-1 models follow the concept recommended in the *Loop 303 Camelback Basins Candidate Assessment Report* (Loop 303 Camelback Basin CAR), which was prepared by Aspen Consulting Engineers for FCDMC in August 2008 (Reference 3). It was recommended in the Loop 303 Camelback Basin CAR that flows from the SR303L drainage channel north of Camelback Road be diverted and discharged to the east via a drainage channel along Camelback Road and outfalls to Bullard Wash. The Camelback Road Basin recommended in the Loop 303 Camelback Basin CAR is a very small basin, which only accepts the flow from the west along Camelback Road. Revisions have been made per the completed SR303L drainage projects. All the flows in the SR303L drainage channel north of Camelback Road and the flow along the north side of Camelback Road west of SR303L will drain into the Camelback Road Basin. The basin outlet is the SR303L drainage channel to the south via a bleed-off pipe and an outflow structure. No flow is diverted to the east along Camelback Road. The values of "TAREA", the second field of HC records, were revised to reflect the changes of cumulative drainage areas.

I-10/SR303L T.I. Basin Modifications

The I-10 Basin size has been reduced from the I-10/SR303L Traffic Interchange (T.I) design. The I-10 West Basin has been eliminated. McDowell Road Upper Basin and McDowell Road Lower Basin have been combined and renamed to McDowell Road West Basin. A new basin located at Thomas Road between Cotton Lane and SR303L has been designed as the McDowell Road East Basin. The Sarival Avenue Basin has been moved from the northeast to northwest quadrant of the I-10/Sarival Avenue T.I. The Sarival Avenue Basin, RID Canal North Basin, RID Canal South Basin, and Basin 4 (located to the north of McDowell Road and east of SR303L), which were not modeled in the FCDMC's HEC-1 models, have been added to the updated HEC-1 models. The on-site detention basins, which drain the depressed directional ramps, were not modeled in the updated HEC-1 models. The McDowell Road East Basin, the McDowell Road West Basin, and the I-10 Basin were included in the updated HEC-1 models to function with a common water surface elevation. Connector reinforced concrete box culverts are provided to function as equalizers between these basins.

Channel Routing and Manning's "n" Value

Channel routings were updated based on channel dimensions shown on the six sets of SR303L as-built plans. Manning's "n" value used for the SR303L drainage channel was changed to 0.018 because the concrete-lined channel is unformed (tined or roughened) to discourage skate boarding.

Detention Basin Storage Routing

Detention basin storage routings were updated based on data included in the final drainage reports, as-built plans, and the HEC-1 models provided by the SR303L final designers.

Flow Routing Order Investigation for the Existing ADOT Basins

Per FCDMC's comment, PB performed investigation to ADOT's four detention basins located north of I-10 between Bullard Avenue and Dysart Road. Based on the field reconnaissance trip and review of the I-10 as-built plans, it was concluded that the FCDMC's comment regarding the ADOT Basins routing order is correct.

The existing ADMPU AHA HEC-1 models were modeled as from Basin B83 (or ADOT Basin 4) to Basin B84 (or ADOT Basin 3). ADOT Basins routing order has been updated as from Basin B84 (ADOT Basin 3) to Basin B83 (the east most basin – ADOT Basin 4). The reason is that there is a 48-inch outlet pipe from Basin B83 (Basin 4) to Agua Fria River running along Dysart Road and Van Buren Street per ADOT I-10 as-built plans (Project No. I-IG-10-2(37).

Detailed Descriptions of Changes to ADMPU AHA HEC-1 Models

Detailed descriptions of changes to the HEC-1 records are documented in the updated HEC-1 models either marked with "*" or using KM records. Any changes to the original HEC-1 records from the ADMPU AHA are marked with "*" for reference. No records were deleted from the models.

Revised HEC-1 Schematics and Updated HEC-1 Models

The HEC-1 schematics have been revised for all three HEC-1 models. Three HEC-1 Schematic exhibits with 2014 aerial images are included on the compact disk in this report for three updated HEC-1 models including Existing Conditions with Partially Completed CIP in Place (WT_EXST.DAT), Existing Conditions with CIP in Place (WT_EXCIP.DAT), and Future Conditions with CIP in Place (WT_FUCIP.DAT).

Following is a summary of the changes made in both the Existing Conditions and Future Conditions "with CIP in Place" schematics:

- Channel routing L02L05 has been divided into two segments: L0205A and L0205B.
- Followings have been revised due to the Prasada development:
  1) Sub-basin L13 has been divided into Sub-basins L13A and L13B.
  2) Storage routing SRL13B has been renamed as SRL13A.
  3) Diversion routine DL13BN and a new hydrograph combination CPL13B have been added to the schematic.
  4) Channel routing L13B13 has been renamed as 13A13B.
- Storage routing SRL34B, Diversion DL34BN, hydrograph combination CPL34, and channel routing L34B34 have been removed, and hydrograph combination CPL34 has been renamed as CPL34B due to the elimination of Olive Avenue Detention Basin.
- Diversion DSRL39 and hydrograph combination CPCHNL have been added to model the outflow from Northern Avenue Detention Basin.
- Followings have been revised to reflect the changes at the Camelback Road Detention Basin: Diversion DVL541 and DVL54, hydrograph combination COBFLW have been added to the schematic.
- Channel routing L67L68 has been removed due to the elimination of channel from CPL67 to CPL68.
- Channel routing L70L71, hydrograph combination CPL72A have been added and the hydrograph combination CPL72 has been renamed as CPL72B to reflect the change at I-10/SR303L TI.
- A flow direction line (dashed line with an arrow) has been added along the Van Buren Street to model the outflow from White Tanks FRS #4.
- New hydrograph combination CPRID and channel routing RIDS13 have been added.
- Followings have been revised to reflect the changes at RID Canal North Detention Basin: Storage routing SRB99 has been added. Channel routing B99S11 has been removed.
- Storage routing SRB100 has been added to reflect the storage routing at Sarival Avenue Detention Basin.

- Followings have been revised to reflect the changes at RID Canal South Detention Basin:
  1) Channel routing S11S14 and hydrograph combination CPS14A have been removed.
  2) Storage routing SR11 is connected to hydrograph combination point CPRID.
- Followings haven revised to reflect the ADOT Detention Basins routing order changes:
  1) Channel routing B83B84 has been renamed as B84B83.
  2) Flow routing order has been changed from CPB83→SRB83→B83B84→CPB84 →SRB84 to CPB84→SRB84→B84B83→CPB83→SRB83.
- Channel routing S26S31 has been divided into S26S31A and S26S31B.
- Storage routing SRS31 has been removed to reflect the elimination of Railroad Detention Basin.
- Followings have been changed to reflect the elimination of White Tanks FRS #4 Outlet channel to the south: Storage routing SRS77 and SRS78, channel routing S77S78 and S78S79 have been added to the schematic.

4.0 OPTIONAL TASK NO. 1

The purpose of this optional task is to investigate and hydrologically analyze existing developments (such as Suncor Developments) within the ADOT Basins Watershed and to update hydrology models for the proposed White Tanks FRS No. 4 Outfall that was not analyzed in the ADMPU AHA.

A Technical Memorandum has been prepared to document the findings and recommendations of the Optional Task No. 1 (Reference 4). Figure 3 shows Suncor properties – A Planned Area Development, called Palm Valley, within ADOT Basins Watershed with HEC-1 Schematic.

ADOT Basins Watershed

PB reviewed the 2007/2008 aerial photography and the 2013/2014 aerial photography to identify any recent development within the ADOT Basins Watershed. PB researched the development plans within the ADOT Basins Watershed, which is primarily located within the Suncor Development – Palm Valley Master Plan inside the City of Goodyear.

PB researched and verified the existing developments with an on-site stormwater storage over 2 acre-feet in volume. PB utilized the HEC-1 Schematic, Palm Valley PAD Phasing Map and aerial photographs, and verified any development within the ADOT Basins Watershed providing the required on-site stormwater storage volume.

It should be noted that the Palm Valley PAD was proposed and devloped by Suncor Development. However, the Suncore filed bankruptcy in February 2012. There are only three Suncore properties per the Maricopa County Assessor website and those Suncore properties are shown in Figure 3.

It is concluded that the Suncor Development – Palm Valley within the ADOT Basins Watershed has implemented the on-site retention requirements for the developments occurred north of McDowell Road. However, the developments south of McDowell Road have the on-site runoff directly draining into four ADOT Basins along I-10.

The three HEC-1 models, WT_EXST.DAT, WT_EXCIP.DAT, and WT_FUCIP.DAT have been updated to reflect the removing of the on-site retention for the developed area located at Drainage Sub-Basins B73, B74, B84 and B83. ADOT Basin freeboard reductions due to removal of the on-site retention were identified for all three HEC-1 models. For the three conditions considered, the ADOT Basins have enough freeboards (from 6.8 to 11.7 feet of freeboards) to hold the additional storage volumes needed for the developed areas located in Drainage Sub-Basins B73, B74, B84 and B83.

White Tanks FRS #4 Outfall

A 90" Pipe was proposed by FCDMC along the Van Buren Street from White Tanks FRS #4 to the Loop 303L Outfall Drainage Channel to convey the outflow from the White Tanks FRS #4 to the east then to the south into Gila River. This proposed pipe was modeled in the Existing Conditions within CIP in Place Model (WT_EXCIP.DAT) and Future Conditions with CIP in Place Model (WT_FUCIP.DAT).

The outflow hydrograph from White Tanks FRS No.4 has been developed using the HEC-1 model FC24BASD.DAT provided by FCDMC. This model was developed by Wood, Patel & Associates, Inc. for the White Tanks FRS #4 Remediation Project.

The drainage area at White Tanks FRS #4 has been revised in the updated the Existing Conditions within CIP in Place Model (WT_EXCIP.DAT) and Future Conditions with CIP in Place Model (WT_FUCIP.DAT). Since the White Tanks FRS #4 accepts the flow from White Tanks FRS #3, the total drainage area at White Tanks FRS #4 has been increased from 19.97 to 41.49 square miles (19.97+21.52=41.49).

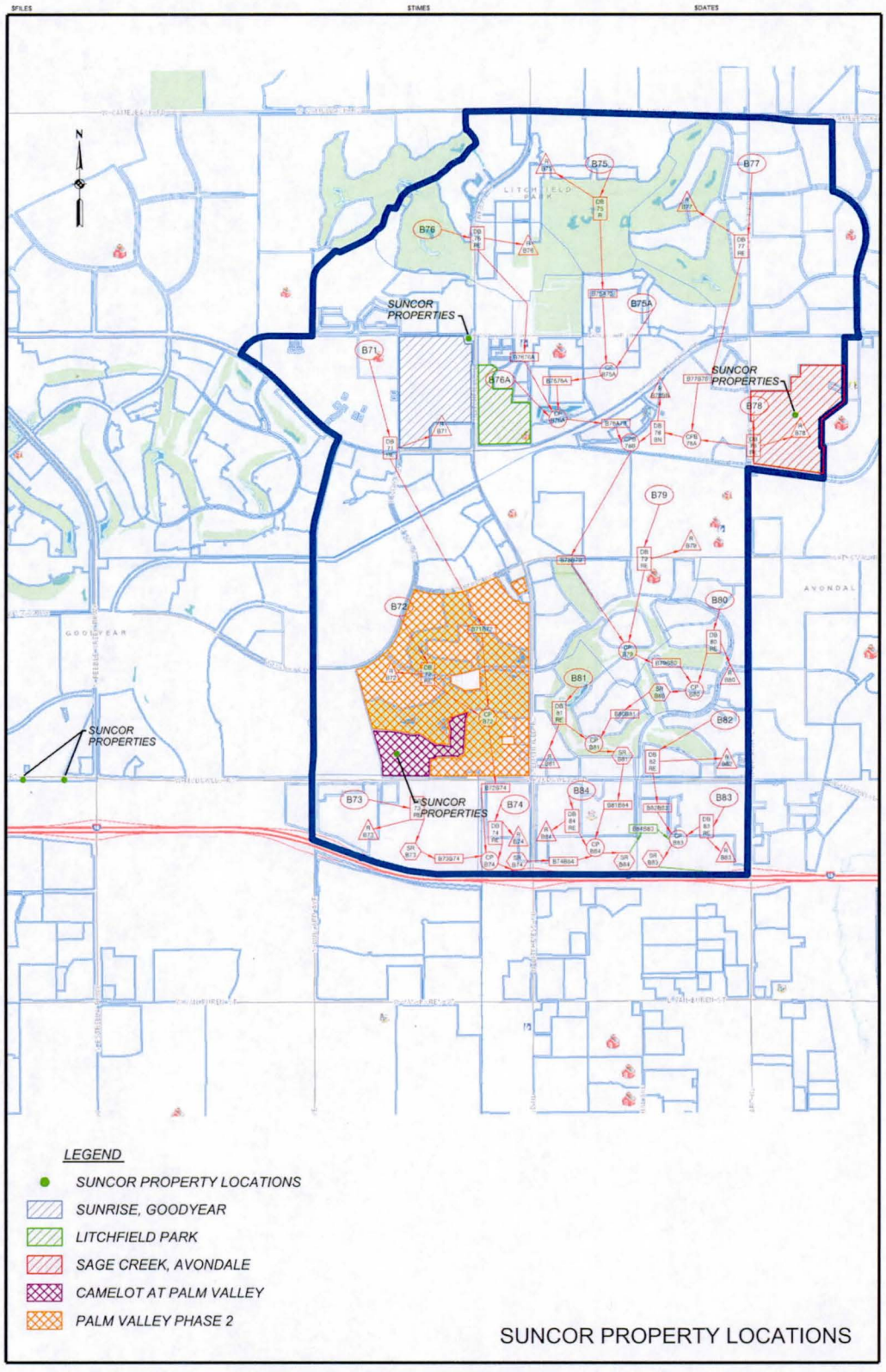


Figure 3: Suncor Properties in ADOT Basins Watershed with HEC-1 Schematic

5.0 FINAL RESULTS

Three HEC-1 models were updated three conditions for the 100-year, 24-hour storm event. Although there are two major basins (Major Basin 01 and Major Basin 02) for the ADMPU AHA study area, but only the Major Basin 01 hydrologic models were updated. In addition, this project did not update the land use and soil and bedrock maps because they have not changed from the ADMPU AHA study conditions.

It should be noted that the updated model descriptions and HEC-1 model names were changed. The HEC-1 model names are summarized below:

ADMPU AHA Model Description	Updated Model Description	Updated HEC-1 Model Name
Existing Conditions	Existing Conditions with Partially Completed CIP in Place	WT_EXST.DAT
Existing Conditions with CIP in Place	Existing Conditions with CIP in Place	WT_EXCIP.DAT
Future Conditions with CIP in Place	Future Conditions with CIP in Place	WT_FUCIP.DAT

There were four major changes made in the updated hydrology models as follows:

1. **Completion of the SR303L Freeway and Drainage Systems** – As-built plans were collected and used including six ADOT SR303L projects from I-10 to Mountain View Boulevard near Grand Avenue (US 60). In addition, the bid documents of the FCDMC's Loop 303 Outfall Drainage System from Woodlands Avenue to Gila River were obtained and used.
2. **Additional completion of the Capital Improvement Projects** – There are approximately 12 miles of additional completion of capital improvement projects since the completion of the ADMPU AHA in 2009.
3. **Optional Task No. 1** – Based on the findings, the three HEC-1 models have been updated to reflect the removing of the on-site retention for the developed area located between McDowell Road and ADOT Basins. A 90" Pipe proposed by FCDMC along the Van Buren Street from White Tanks FRS #4 to the Loop 303L Outfall Drainage Channel was modeled in two HEC-1 CIP in Place Models (WT_EXCIP.DAT & WT_FUCIP.DAT). A Technical Memorandum has been prepared to document the findings and recommendations of the Optional Task No. 1 (Reference 4).

The HEC-1 schematics have been revised for all three HEC-1 models. Three HEC-1 Schematic exhibits with 2014 aerial images are included on the compact disk in this report. The HEC-1 output files are not printed, but the electronic files for all three HEC-1 models are provided on the compact disk in this report.

6.0 REFERENCES

1. Flood Control District of Maricopa County, *Final Hydrology Report for Loop 303 Corridor/White Tanks Area Drainage Master Plan Update Area Hydrology Analysis in Maricopa County, Arizona (FCD 2007C031)*, prepared by HDR Inc.

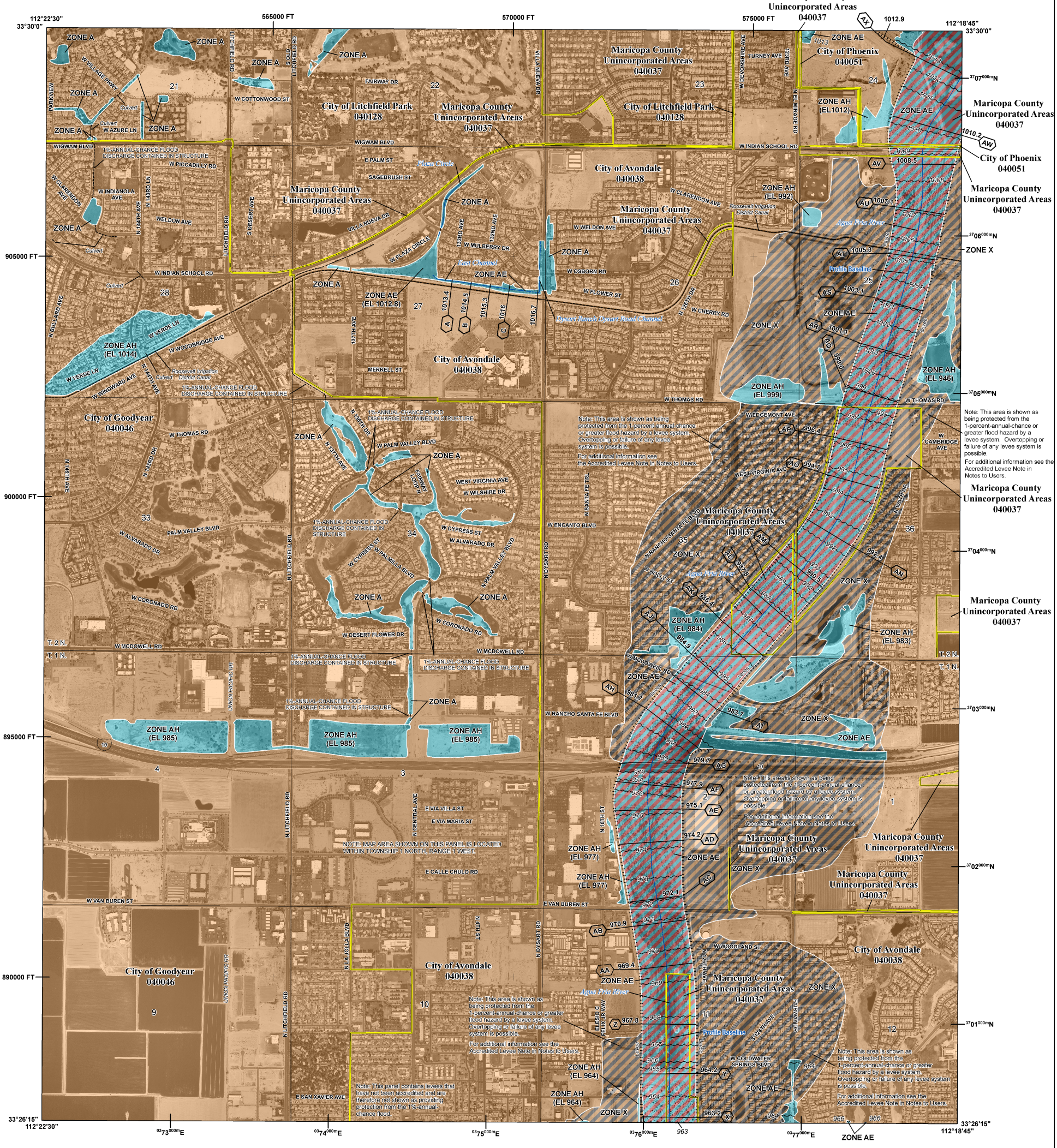
2. U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package, Version 4.1,* June 1998.

3. Flood Control District of Maricopa County, *Loop 303 Camelback Basins Candidate Assessment Report,* prepared by Aspen Consulting Engineers, August 2008

4. Flood Control District of Maricopa County, *Final Technical Memorandum for Optional Task #1 – ADOT Basins Watershed and White Tanks FRS No. 4 Outfall, associated with Loop 303 Corridor/White Tanks Hydrology and Delineation Update, Phase 1 – Updating the Existing Hydrology Model (FCD 2014C003, Assignment #1),* Prepared by Parsons Brinckerhoff, June 2015.

Appendix E

FEMA FIRM Exhibit



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A,V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was derived from U.S. Census Bureau TIGER files, dated 2014, and digital data provided by the Flood Control District of Maricopa County. Digital orthophotograhy was provided by the Flood Control District of Maricopa County. The imagery was flown in Fall 2013 and was produced with a 0.8 foot ground sample distance.

ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/national-flood-insurance-program.

SCALE

N

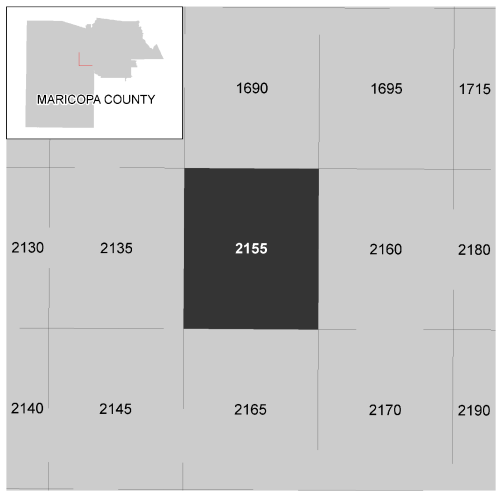
Map Projection:
NAD 1983 HARN StatePlane Arizona Central FIPS 0202 Feet Intl.
Western Hemisphere; Vertical Datum: NAVD88

1 inch = 1,000 feet 1:12,000

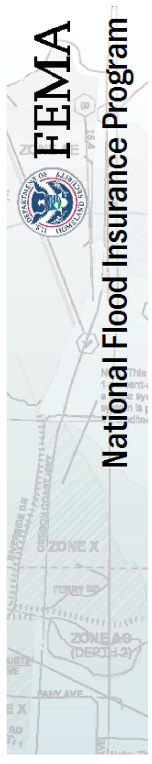
0 1,000 2,000 4,000 feet

0 250 500 1,000 meters

PANEL LOCATOR



* PANEL NOT PRINTED



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA
and Incorporated Areas

PANEL **2155** OF **4425**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
AVONDALE, CITY OF	040038	2155	M
GOODYEAR, CITY OF	040046	2155	M
LITCHFIELD PARK, CITY OF	040128	2155	M
MARICOPA COUNTY	040037	2155	M
PHOENIX, CITY OF	040051	2155	M

VERSION NUMBER
2.3.3.2

MAP NUMBER
04013C2155M

MAP REVISED
September 18, 2020

J2
Design