Prepared for:

Rotary Park Plan Update 2006

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Prepared by:

RBF CONSULTING

Bullhead City Rotary Park Plan Update

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The Project

Background and Purpose

The City of Bullhead City has a unique identity in that it shares various cultural, historic, and recreational opportunities. Residents include those who have been there for many generations, along with an influx of new residents from across the country and globally. Historic mining and river operations originally attracted residents to this region, and mostly today the area harbors casino and tourist attractions that are all based around the Colorado River. What's most important in the City of Bullhead City are the residents, and they should have ample opportunities to enjoy the Colorado River in an area where high temperatures are frequent throughout the year. Rotary Park is a Gateway to the Colorado River, and shall be appropriately designed to allow for easy and safe access. Rotary Park will also contain various program elements to fit the recreation needs of the city, which will include active and passive play activities.

The City of Bullhead City, Arizona has undergone rapid transformation and growth since the last revision of the Rotary Park plan in 2000. The City is undergoing population increase, and the pressure on the recreation system is reported to be intense. Construction has been implemented based on the various program elements discussed in the 2000 plan, but there is still need to carry on with these improvements, or to make alterations to the plan based on residents and city staff opinions as of 2006. Rotary Park is approximately 212 acres and is bounded on the north by Riverview Drive, on the east by Lakeside Drive, and on the south by the Colorado River. It is leased by the City from the Bureau of Land Management, and is identified in the 1991 General Plan Update as a regional park serving the City of Bullhead City.

Program elements built and improved upon since 2000 include; beach improvements and access, the riverfront trail, skate park, basketball courts, ramada/picnic areas, 4 softball fields with concessions, soccer field improvements, multiple restrooms, landscaping, parking facility improvements, several playgrounds, and group camping with a non-motorized boat launch at the south end of the park. Lastly, the Section 10 wastewater treatment plant is currently generating water to be used for irrigation of this park from an existing effluent pond.

The purpose of the Conceptual Plan Update is to design a flexible planning tool for the City staff to initiate funding and design of proposed improvements, to integrate the existing facilities, and to balance the needs of recreation and open space users with the community that exists adjacent to the park.

Planning Process Overview

The City engaged the firm of RBF Consulting in analyzing the site in terms of existing conditions, performing inventory analysis of program elements, analyzing drainage and traffic patterns for opportunities and constraints, engaging the general public, city staff, and stakeholders in the planning process, and recording the results of the process for future use. This document represents a summary of this effort.

Inventory and Analysis

Data Collection

A conceptual plan for the site had been completed previously by City Staff, and approved by the Parks and Recreation Commission and City Council. The major objection to this original plan was "too much roadway and parking along the river." This resulted in the creation of the 2000 Bullhead City Rotary Park Concept Plan. This plan gathered city staff and public input to improve and make additions to Rotary Park with the inclusion of various program elements. The previous 2000 Rotary Park Master Plan served as a base in updating the plan for 2006. Site plans, survey drawings provided by the city, site surveys, aerial/topographic data acquired by the consultant, drainage data/reports, discussions with City staff and the public, all resulted in adequate data for making the plan update.

Grant Improvements Implemented Since 2000

The State Lake Improvement Grant enabled the City to improve the beach area by providing construction of restrooms, sidewalks, ramadas, ADA access, landscaping, paved/lighted parking adjacent to Balboa Rd, pathway lighting, and trash receptacles. Other grants have enabled construction of the basketball courts, softball fields, soccer fields, first aid station, boat ramp, dock, and their associative parking. The KaBOOM playground is found in the north beach area that features various swing and jungle gym equipment. Lastly, the skate park and expansion of the Colorado River Heritage Greenway Trail has also been implemented since 2000.

In 2005 the city constructed a non-motorized boat launch, group campground, and amenities at the southeast corner of the park assisted by SLIF funds.

Lighting for all soccer fields, improvements to playgrounds, grass and landscaping on the north beach, benches, ramadas, and a drinking fountain have been funded for 2006 and 2007 with assistance of grant funding.

Reclaimed Water Irrigation

An irrigation system as been placed throughout the park site with reclaimed water lines dispersed centrally from the located effluent pond. The effluent lines have been placed throughout the park, but the lines are rarely used. These lines should be utilized to minimize potable water use, and can be used to irrigate anticipated turf areas that are in conjunction or adjacent to the reclaimed water lines. The softball fields to the north, proposed baseball fields to the south, dog park, and the proposed soccer field to the west are in proximity of the reclaimed water lines (See conceptual plan update exhibit for proposed uses). Appropriate signage will be placed giving warning of the risks of reclaimed water and that users should use certain precaution when in these areas.

Land Analysis

A jurisdictional wash delineated by the Corps of Engineers in 1998 exists in the northeastern portion of the park. It flows for about 1500 feet into the site. Proposed program elements are designed to not encroach into the delineated area. The Corps of Engineers has advised the City that proposed uses could be allowed via approval of the applicable "Nationwide Permit" (NWP) as long as the area of impact is no more than .5 acres.

Drainage for the most part is into a depression at the center of the site. At this point, floodwater becomes sheet flow and currently flows across the existing southern soccer fields to a drainage channel at the southeast corner of the site. A drainage analysis has been performed to reroute flows from the center of the site directly south to the Colorado River through a 80' wide channel with slopes to 8:1. This will proceed from the end of the delineated wash; will flow through a weir structure over the park boulevard road into the parking lot west of the soccer fields, and will continue to flow directly south to the Colorado River (see conceptual plan update exhibit and appendix A).

An existing effluent pond and a pump station structure exists and will remain on site. The pond is raised aboveground seven feet to stay out of the floodplain. This may cause some access difficulties, and trails would have to be appropriately designed. The area around the pond allows for improvement to make the area a more pleasing environment for trail users.

Existing Elements

A lift station exists and will remain at the southern end of the soccer fields. A well is also near this facility.

A fiber-optic cable runs east/west starting at the Lakeside Dr/Riverview intersection and travels almost parallel to Riverview Dr. to the river.

A marina and motorized boat launch exists associated with several other structures. This includes an entry drive with pay station, first aid station, a substantial paved and lighted parking lot (approximately 80 total spaces), small areas with picnic tables, gazebo, and ramadas. Improved access to these areas is shown in the conceptual plan update.

Basketball courts exist between the front entry parking and the beach.

Four softball fields have been recently constructed on the north end of the park with accommodating facilities, restrooms, and concessions.

Eight soccer fields exist at the eastern edge of the site along Lakeside Drive. An access road enters the park from Lakeside Drive and follows the perimeter of the soccer fields to the group camping area at the southeastern end of the park. The fields are partially lighted and are irrigated using potable water.

A model airplane paved runway is west of the soccer fields and has adjacent parking.

A large stockpile of rock exists near the model airplane runway and belongs to the Bureau of Reclamation. This will remain at the current location in Rotary Park to receive future Title 28 grants from the Bureau of Reclamation through BLM. These grants are used to provide funds for park improvements, and it is recommended to leave the Reclamation stockpile on site to receive future grants. The stockpile is primarily for the protection of bank lines to the Colorado River during flood emergencies, and could possibly be relocated within the park to create additional park space and to address safety concerns near parking. Aesthetic treatment will be proposed around the stockpile to improve parking areas, and signs can also be placed warning park users to avoid climbing in the area.

ADA compatible access to the river occurs in two locations north of the boat launch and near the beach. There are no sidewalks along Riverview Drive or Lakeside Drive. Having sidewalks along the north side of the park and the east side would establish a definite border around the park.

Public and Stakeholder Involvement

Staff Workshop

A staff workshop was held with the Technical Advisory Committee after the public meeting on July 12, 2006. Program elements from the public meeting were discussed and emphasis was placed on certain issues in the park regarding shade, landscaping, roads in the park, access to the beach, and establishing an event area in the Northwestern Area of the park site.

Public Meetings

Public input meetings were held on July 12 and September 26 for the Rotary Park Concept Plan Update. The July 12 meeting was to consider if the program elements mentioned in the 2000 plan were still applicable to the updated plan. Results from the July 12 meeting concluded to continue with some of the program elements in the 2000 plan and to discontinue others based on needs assessments from those in the public and the city staff. (See 2006 vision and program elements from July 12th public meeting).

The objective of the September 26th public meeting was to show the plan update based on the first meeting held in July. Results from the September meeting concluded in re-configuring the internal circulation system, moving the proposed soccer field adjacent to the existing field, switching the location of the dog park to the southeast portion of the park, providing additional ramp/ADA access to the cove north of the marina, placing emphasis on the actual trail design, creating a boulevard concept with the main road network that bisects the park, and adding sidewalk/vegetation improvements along Lakeside and Riverview Drive.

Review Agency Session

Members of the reviewing agencies (Parks & Recreation Commission & Council) were present at the July 12th and September 27th public meetings, and gave their input on existing elements in the park, and what they would like to see built after 2006. The reviewing agencies will provide additional input at the next reviewing agency sessions held on December 7th, and December 19th.

The Parks and Recreation Commission hearing had minimal comments in regards to the version of the Rotary Park Plan on November 15th. Questions were asked from members of the Parks and Recreation Commission in regards to the placement of the proposed concession building between the proposed soccer field and the existing soccer field, and adequate parking supply. The consultant and city planner addressed these questions, and Parks and Recreation members came to agreement with the current plan.

2006 Vision and Goals Summary

Vision Statement: The City of Bullhead City envisions a land-and water-based park serving a variety of regional users that includes a balance of active sports, passive recreation, and natural areas supported by complementary infrastructure.

2006 Vision and Program Elements from July 12 Public Meeting

Bulllhead City Rotary Park Master Plan

2000 Concept Plan Program Elements

- Memorial Garden
- Additional Courts, Volleyball, ~~Tennis, Raquetball~~
- Additional Beach Improvements Picnic Tables, ~~restrooms~~, ADA Beach Access
- Turf
- ~~CRC~~
- ~~Amphitheatre/Near Beach~~
- ~~Toddler Playgrounds Near Ballfields~~
- ~~Wildflowers/ Native Grasses~~
- Riparian Area
- Natural Area
- ~~River Trail~~
- ~~Relocating Rock Pile~~
- Playground & Parking West of Soccer Fields
- ~~Golf Driving Range~~
- Heritage Trail
- Botanical Trail with Stabilized Decomposed Granite

LEGEND

To be continued in the 2006 update

No longer necessary

Existing/Implemented

- Passive Elements in Rotary Park Playground
- Beach Amenities
  - Retaining Wall
  - Beach Front Area
  - ADA Beach Access
  - Paved Multi-Use Path
  - Restrooms
- Basketball Courts
- Parking
- Skate Park
- Boat Launch/Ramp, Large Group BBQ & Picnic Area
- Existing Softball Fields, restrooms, concessions
- Baseball Fields, Concessions
- Existing Effluent Pond
- Jurisdictional Wash
- 8 Existing Soccer Fields
- Model Airplane Runway
- Parking West of Soccer Fields
- Rock Pile
- Maintance Yard
- Lift Station
- Amphitheatre/Southeast
  - Group Camping
  - Restrooms
  - Non-motorized Boat Launch
  - Natural Area

2006 Concept Plan Update

- Memorial Tree Garden, turf, or other location
- Additional Volleyball courts complimentary to beach
- Additional beach areas farther south, maintaining sand, looking at possible beach island, pedestrian access between coves, addressing safety concerns to beach.
- Preserving and establishing internal trail network between the Heritage, River, and botanical trails. These trails will allow access through the Riparian and Natural Areas.
- Designation for future bridge across the Colorado River
- Shade and benches around playgrounds for adult supervision
- Emergency Phone Boxes
- Adequate facilities for park hosts and Park Ranger
- Operational lighting for fields and courts
- Possible effluent pond improvements, amenities, providing more for a pleasing destination
- Shade/trees near parking
- Possible Dog Park
- More roads and linkages to the beach, and other areas of the park
- Signage,water fountains, signage program
- Activities in open turf areas, putting, frisbee golf, horsshoes
- Senior Activities, amenities, benches for board games
- Exercise stations
- Additional Soccer field to the north of the existing soccer fields, Provide concession facilities, additional parking, generate improvements between fields to control dust.
- Possible fishing platform in riparian area where hard slopes currently exist.

2006 Programming Element Priorities

Active Recreation Priorities	Tentative Construction Dates
1) Additional soccer field. (lighting, fencing, benches, shade, outside field improvements, dust control, parking, and restroom/concession building).	Mid 2008
2) South baseball fields (lighting, fencing, benches, shade, outside field improvements, dust control, parking, and restroom/concession buildings).	Late 2008-2009
3) Additional Volleyball Courts	Late 2007
4) Dog Park	Late 2007
5) Future Fields	2010

Passive Recreation Priorities	Tentative Construction Dates
1) Internal trail network within the Natural/Interpretive Zone (Designated Paths, decomposed granite around effluent pond, shade/vegetation approximate to existing effluent lines, signage program, exercise stations, and benches).	Early 2010
2) Viewing/Fishing Platforms	Late 2008
3) Disc Golf	Early 2010
4) Practice Putting Area	Mid 2009
5) Horseshoe Court	Mid 2008

Other Priorities	Tentative Construction Dates
1) Additional road access at Chaparral Drive.	Mid 2007
2) North beach loop and associative parking.	2008
3) Balboa Road extension with trees, vegetation, and trails/sidewalks.	2009
4) Perimeter curbs, gutter, and sidewalks on Lakeside and Riverview Drives.	2012
5) Trees and vegetation along Riverside and Lakeside Drives.	2009
6) Safety signs, emergency phone boxes	Mid 2007- Late 2008

7) Dust Control	On going
8) Shade and benches approximate to parking	On going
9) Water Fountains	On going
10) Colorado River Bridge designation and final design	Future

2006 Plan Update

Conceptual Plan Breakdown

Activity zones are identified on the Conceptual Plan (see conceptual plan update exhibit). There are five zones that include the Beach, Active Recreation, Natural/Interpretive, Riparian, and Group Active.

Beach Zone: The beach zone shall include a mix of passive and active play activities. There are numerous shade structures that allow for picnicking and retreat from the sun. The area provides for beach sort of play that is family oriented, and shall be patrolled and secured to deter any violent, vandalistic activities. Active play areas in the beach zone include the sand volleyball courts, playground equipment, swimming, and water sports.

Active Recreation Zones: These zones provide for active recreational activities that are to have intense uses associated with organized sports, and have open turf areas for informal play. These active areas include sports sessions associated with softball, baseball, soccer, dog parks, basketball courts, skate park, marina & boat launch, and the model airplane runway. The Active Play area consists of mown turf area in the sports fields and informal play areas. Turfed areas may be irrigated using potable or reclaimed water irrigation lines, and turfed areas under reclaimed irrigation should be posted for recreational users.

Natural/Interpretive: The Natural/Interpretive area consists of the Jurisdictional Wash, the area around the effluent pond, and the natural terrain that transverses to the southwest between the baseball and soccer complexes. It is intended that the natural area be planted with native species, which may include wildflowers and grasses that can be irrigated with the effluent lines. It will provide an alternative to the turf areas of the Active Recreational Zones, and will provide for passive activities that will include trail and mountain bike use, exercise stations, and signage to give appropriate direction throughout the park.

Riparian: This zone primarily follows the Colorado River and users can enjoy this area by using the River View Trail. This zone allows for passive type activities and exceptional views of the river. This trail will also provide access to the viewing/fishing platforms, and connection to the Natural/Interpretive zone and Heritage Trails.

Group Active: This zone is primarily at the southeastern end of the park and allows for group activities associated with the amphitheatre in the group camping area. The non-motorized boat launch is also in this zone that allows use for kayak and canoe type users.

Program Elements to be Implemented after 2006

The requested program elements listed below have been incorporated into the conceptual plan update exhibit. This exhibit represents a final build out of what the project shall look like. A brief description of each follows below:

Ball fields: West of the existing effluent pond are three ball field complexes, one containing four softball fields, one containing four baseball fields, and the third for softball/little league fields. These complexes will be fully lighted, fenced, and each supported by a concession stand/restroom. The eastern edge of the site holds two existing soccer fields, and a new designation will be established for an additional soccer field to the west of the existing north soccer field. Parking, lighting, access off of the proposed road, and a concession/restroom will be provided with the new soccer field.

Beach Access: The beachfront shown has 2800 linear feet of accessible sandy beach. When fully built out, there will be more ramadas, sand volleyball, barbeques, and tables for seniors who wish to engage in passive/board game activities. Parking and road access will be extended from the northwestern corner parking lot to the beach area to provide loading/unloading accessibility.

Bridge Location: The conceptual plan update exhibit shows a possible bridge location at the northwest corner of the park. This location has potential for a bridge that would perpendicularly bisect the river and would follow the Riverview Drive alignment. Up to a four-lane bridge could be constructed in this area to accommodate traffic speeds up to 35 miles per hour, and future bridge studies would have to occur to determine the correct position and design of the bridge if constructed at this location. The bridge would need to be designed to have minimal disturbance with the park, and would need to provide accessibility for the Riverview trail that would extend under the bridge and over the channel to the marina and future developments.

Court Play: Volleyball courts are shown to be located in the beach area, particularly in the cove north of the marina.

Dog Park: The dog park designation shall be placed south of the proposed soccer field on the southeast side of the park. The dog park will be in a convenient location that will provide convenient access to the trail systems that disperse throughout the park.

Maintenance Yard: A new building will be placed in the existing maintenance yard near the existing pump station.

Passive Play Activities: A horseshoe court is conveniently placed near the ramada/picnic area for use during family/event barbeques or picnics. A Disc Golf course layout is also placed west of the softball fields amounting to a total of 9 holes. Disc golf at this location will have minimal interference with the picnic, basketball, skate, and trail activities.

Paths and Trails: Joining the northeast corner of the park and the trail along the river is an abundance of trails/paths that are mostly dispersed throughout the Natural/Interpretive zone of the park. The trails connect to the Colorado River Heritage Greenway Trail that will eventually join Davis Dam Campground and the Colorado River Nature Center. It is intended to have these trails as designated pathways that are suitable for hiking, running, or biking. The material of the trails will be composed of natural soils or decomposed granite, and will be suitable for planted trees to provide shade for trail users. Effluent lines are in the region, and these can be used to irrigate natural vegetation to create a pleasing destination. A trail is shown in the conceptual plan update exhibit to circle the effluent pond and shall provide adequate shade and decomposed granite material to improve the aesthetic quality. Trail nodes are identified in the conceptual plan update exhibit, and shall provide opportunities for signage, shade, exercise stations, and water fountains (also see section trails exhibit). The signage will give direction to trail users, and can possibly be used for educational opportunities for explaining the plants of the Mojave Desert, or providing general facts and history about the Colorado River Region. Trails will cross access roads at certain locations and designated cross walks will be placed for pedestrians. Traffic calming devices can also be used throughout the road/circulation networks in the park to slow traffic and to create a pedestrian atmosphere.

Road/Circulation Improvements: The conceptual plan update exhibit shows the proposed road alignments that will provide access to the proposed ball fields, soccer fields, and the south end of the park at the non-motorized boat launch. The main road-boulevard concept alignment (see Rotary Park Main Boulevard exhibit) will extend from the existing Balboa Road; will curve between the existing softball and baseball field, loop around the south end of the effluent pond, parallel the north end of the proposed soccer field, and will merge into Lakeside Drive at an intersection north of the existing soccer fields. The main road-boulevard concept will be lined with trees, attractive vegetation, and sidewalk/trails for pedestrian users that will provide identity and aesthetic value to the park.

Viewing/Fishing Platforms: Viewing/Fishing platforms are to be established in the Riparian zone off of the River View trail. One can be placed for serious anglers, and one can be placed farther south near the non-motorized boat launch for group activities.

Costs

Rotary Park projected costs are found in the attached spreadsheet at the end of this document. These costs were attained from similar park projects and actual manufacturers, and are intended for budgeting purposes only. Costs will change or update during final design of the program elements and amenities.

Rotary Park Plan Update Projected Costs

Construction Items	Qty.	Units	Unit Price		Total
Soccer Field (Includes Lighting & Concession/Restroom building and parking)	1	Each	1,500,000.00		$ 1,500,000.00
Baseball Fields (Includes Lighting & Concession/Restroom building & parking)	1	Each	1,500,000.00		$ 1,500,000.00
Little League Fields (Includes Lighting & Restroom)	1	Each	900,000.00		$ 900,000.00
Volleyball Courts	2	Each	15,000.00		$ 30,000.00
6' Decomposed Granite Paths X 23,751 LF X $.32 Sq.Ft	1	SF	0.32		$ 45,600.00
Dog Park (2 Acres)	1	Each	100,000.00		$ 100,000.00
Parking & Drives 892,400 Sq. ft X 3.50 Sq.Ft + Lighting (120,000)	892,400	SF	3.50		$ 3,243,400.00
Ramadas 16 X 16	6	Each	25,000		$ 150,000.00
Landscape, Seeding, & Irrigation	4,356,001	SF	1.50		$ 6,534,001.50
Area lighting for trails and open spaces (100 ft spacing)	200	Each	1,500.00		$ 300,000.00
Fitness Stations (8) X (Average $600)	8	Each	600.00		$ 4,800.00
Signs	27	Each	500.00		$ 13,500.00
Benches	35	Each	600.00		$ 21,000.00
Disc Golf (9 holes, landscaping, ammenities)	1	Each	400,000		$ 400,000.00
Practice Putting Area	1	Each	50,000		$ 50,000.00
Horseshoe Court	1	Each	2000.00		$ 2,000.00
Emergency Phone Boxes	8	Each	650.00		$ 5,200.00
Dust Control (Decomposed Granite $.32 Sq.Ft)	164,948	SF	0.32		$ 52,783.36
Drinking Fountain	8	Each	3000.00		$ 24,000.00
Viewing/Fishing Platforms	2	Each	100,000		$ 200,000.00
				Sub total:	$ 14,342,301.50
				15% Contengency	2151345.225
				Total:	$ 16,493,646.73
				Cost per sq.ft	$ 1.79

* Costs are subject to change during final design

CONCEPTUAL DRAINAGE REPORT

Bullhead City Rotary Park

RBF JN 45-102984

Prepared for:

City of Bullhead City

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Table of Contents

List of Tables and Figures

1.0 Introduction

1.1 Purpose

The purpose of this drainage report is to discuss the existing drainage characteristics and the preliminary drainage plan for the Bullhead City Rotary Park. The analyses contained within this report were created for the sole purpose of aiding in the development of the proposed Bullhead City Rotary Park. All of the analyses within this report pertain only to the Bullhead City Rotary Park site. Any use of the contents of this report to make determinations of flows for any location other than the Bullhead City Rotary Park is not recommended.

1.2 Site Location and Description

The Bullhead City Rotary Park is a regional park site of approximately 212 acres in size, located in the City of Bullhead City, Mohave County, Arizona. The Bullhead City Rotary Park is located in a portion of Section 30 of Township 20 North, Range 22 West of the Gila and Salt River Base and Meridian. Riverview Drive and Lakeside Drive respectively bound the north and east sides of the park. The Colorado River bounds the south side of the park. Please see Figure 1.1 Bullhead City Rotary Park Vicinity Map.

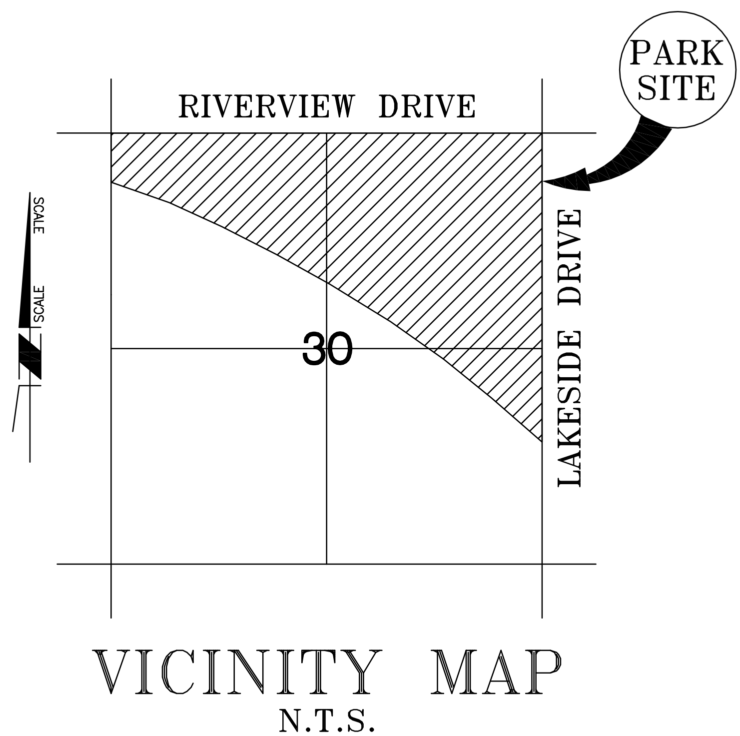


Figure 1.1 Bullhead City Rotary Park Vicinity Map

1.3 Topographic Conditions

The project site consists of partially developed desert land, which slopes to the southeast at an average of 1.0 percent. Storm runoff generally sheet flows across open land with washes and berms tending to concentrate and redirect flows. There is an existing jurisdictional wash that enters the park at its northeast corner and is delineated for approximately 1500 feet into the park site.

1.4 FEMA Flood Insurance Map

FEMA's Flood Insurance Rate Map (FIRM) panels, 0401250020F and 0401250015E, effective June 2, 1995 and March 2, 1995, respectively, classify portions of the property as Zone X (Shaded) and Zone AH (with a ponding elevation of 501 feet (NGVD29)). Zone X (Shaded) is defined as "areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from the 100-year flood. Zone AH is defined as a "special flood hazard areas inundated by the 100-year flood. Flood depths of one to 3 feet (usually areas of ponding); base flood elevations determined." Please see Exhibit 1, FIRM Exhibit.

2.0 Previous Studies

Previous studies that have been performed to assess the drainage conditions in this area were reviewed and evaluated in order to determine their impact on the project's drainage area.

2.1 Marina Boulevard/Lakeside Drive Roadway Improvements

Burgess & Niple previously studied the project area as part the Marina Boulevard/Lakeside Drive Roadway Improvements, completed in March 1994. This report determined existing offsite flows impacting the park site. According to this report a flow of 1,020 cfs, generated from the 100-year, 24-hour storm event, impacts the park site at the corner of Riverview and Lakeside Drives. Offsite flows determined from the hydrology included in this report were used as design flows at the park site at the recommendation of the City of Bullhead City. Please see Exhibit 2, HEC-1 Offsite Drainage Map.

3.0 Offsite Drainage

3.1 Existing Conditions

A flow of 1,020 cfs, generated from the 100-year, 24-hour storm event, impacts the park at its northeast corner. The flow enters a jurisdictional wash at the northeast corner of the site, which lacks capacity to convey the flow. The flow is routed along the wash for approximately 1,500 feet. The flow is discharged into the interior of the park where the water ponds. Flows within the park will pond up to an elevation of approximately 501 feet at which point they overtop the eastern bank of the existing soccer fields at the eastern boundary of the park. The ponded flows are discharged onto Lakeside Drive and are routed south along the road. Flows within the road are ultimately discharged into an existing channel at the south end of Lakeside Drive. Flows within the channel are routed south and discharged into the Colorado River.

The HEC-1 model determines that a flow of 1453 cfs impacts the intersection of Chaparral Drive and Camino Del Rio. The model suggests that this flow will pond up and overtop Lakeside Drive, however, the park site adjacent to the intersection of Chaparral drive and Lakeside Drive is substantially elevated preventing flows from entering the site at this location. Rather, the flows will stage up to approximately 493 feet at which point they will enter an engineered channel on the south side of Chaparral Drive. Flow within the channel is routed first west and then south discharging to the Colorado River.

Additional runoff from residential areas north of the park overtop Riverview Drive and contribute to the ponded flows within the park site. Please see Exhibit 3, Offsite Drainage Map, Existing Conditions.

3.2 Proposed Improvements

The proposed flood control improvements at the park site include a system of detention basins and channels. Flows conveyed by the jurisdictional wash are discharged into a detention basin just north of a proposed roadway extension extending from Lakeside Drive. Flows within the detention basin stage up until they overtop the roadway, spilling into a parking area just west of the proposed soccer fields. The parking lot, which will slope west, will direct flows into a proposed channel. Flows within the channel will be routed south and will discharge into the Colorado River. The proposed detention basin will be equipped with a low flow outlet pipe, which will serve to drain the basin within 36 hours. Additional offsite flow entering the park site will be directed toward the proposed drainage corridor and will discharge to the Colorado River. Please see Exhibit 4, Offsite Drainage Map, Proposed Conditions.

3.3 Future Considerations

Future considerations should be given to the drainage at the park site, specifically the drainage corridor conveying the 1020 cfs at the northeast corner of the park.

The intent of the drainage design is to allow this flow to weir over the entrance road extending from Lakeside Drive, impacting the parking area which will drain west into the adjacent channel, eventually discharging to the Colorado River. However, Because of the proximity of the proposed entrance road to the existing effluent pond, flows will be pinched between the road and the bank of the effluent pond. This tight fit allows for an approximate weir length of only 60 feet. The weir depth needed to convey 1020 cfs across a 60 foot weir is approximately 3.2 feet. This water depth poses potential safety and access problems. A more reasonable water depth of 8 inches would require a weir length of 550. There is also the issue of grading to consider and whether or not it’s even possible to install a weir with a weir depth of greater than three feet. One further concern is that flows being pushed against the bank of the effluent pond may cause erosion and of the pond bank. Erosion protection of the effluent pond bank may be necessary to alleviate this problem.

4.0 Hydraulics

4.1 Channel Design

Preliminary channels were designed with 8H:1V side slopes, with a water depth of four feet and with one foot of freeboard. All channels within the project were sized using a Manning’s n value of 0.030, which is consistent for an earthen channel lined with grass and weeds. A flow of 1020 cfs, taken from the 100-year, 24-hour HEC-1 model created for the Marina Boulevard/Lakeside Drive Roadway Improvements project, was used as the design flow used in determining channel widths. Preliminary channel sizes were determined with the aid of FlowMaster software, developed by Haestad Methods. Please see Exhibit 5, FlowMaster Output.

4.2 Bank Protection

It should be noted that bank protection within the channels might be necessary to avoid channel erosion. Whether or not bank protection is necessary, and the type of protection required will be determined at the preliminary design phase of the project.

5.0 Onsite Drainage

5.1 Design Standards

Onsite runoff will be directed toward the proposed drainage corridors. Flow within drainage corridors will be directed toward the proposed channel system and will ultimately outfall to the Colorado River.

5.2 Retention Basin Design

There will be no onsite retention provided at the park site.

6.0 Conclusion

The analysis contained in this report outlines conceptual solutions for the offsite and onsite runoff at the proposed Bullhead City Rotary Park. This conceptual drainage report discusses the existing drainage characteristics and the conceptual plan for the Bullhead City Rotary Park development. The drainage improvements will meet the City of Bullhead City's drainage requirements. Further analysis will be necessary before design of the drainage facilities can be finalized. The analyses contained within this report were created for the sole purpose of aiding in the development of the proposed Bullhead City Rotary Park. All of the analyses pertain only to the Bullhead City Rotary Park. Any use of the contents of this report to make determinations of flows for any location other than the Bullhead City Rotary Park is not recommended.

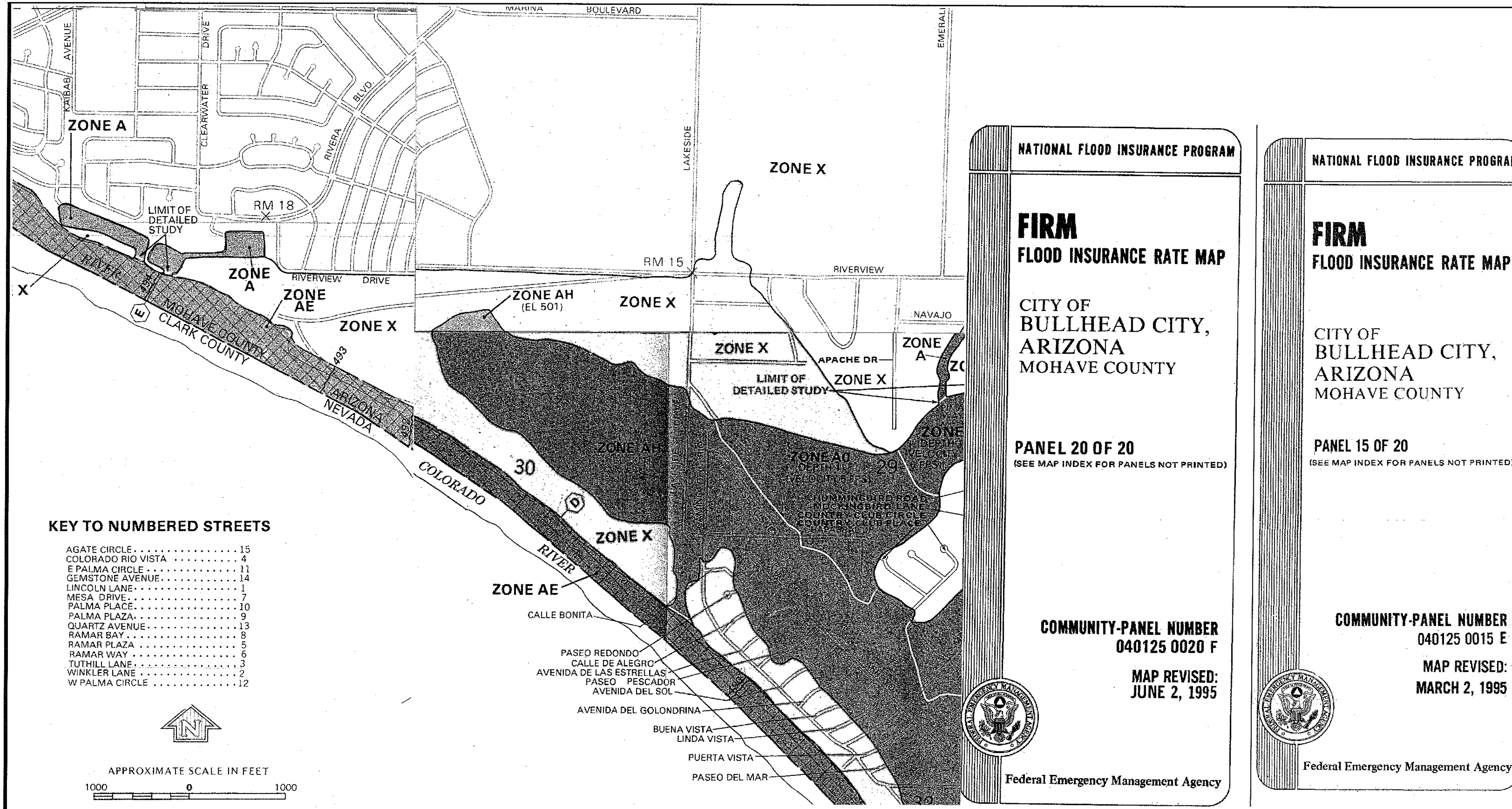
7.0 References

Marina Boulevard/Lakeside Drive Roadway Improvements Drainage Analysis, Burgess & Niple Engineers & Architects, March 1994, revised July 1992.

Drainage Design Manual for Maricopa County, Volume I, Hydrology, Arizona; Flood Control District of Maricopa County, January, 1995.

Drainage Design Manual for Maricopa County, Volume II, Hydraulics, Arizona; Flood Control District of Maricopa County, January, 1996.

Exhibit 1, FIRM Exhibit



BULLHEAD CITY ROTARY PARK FIRM EXHIBIT

RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
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PHOENIX, ARIZONA 85053-7550
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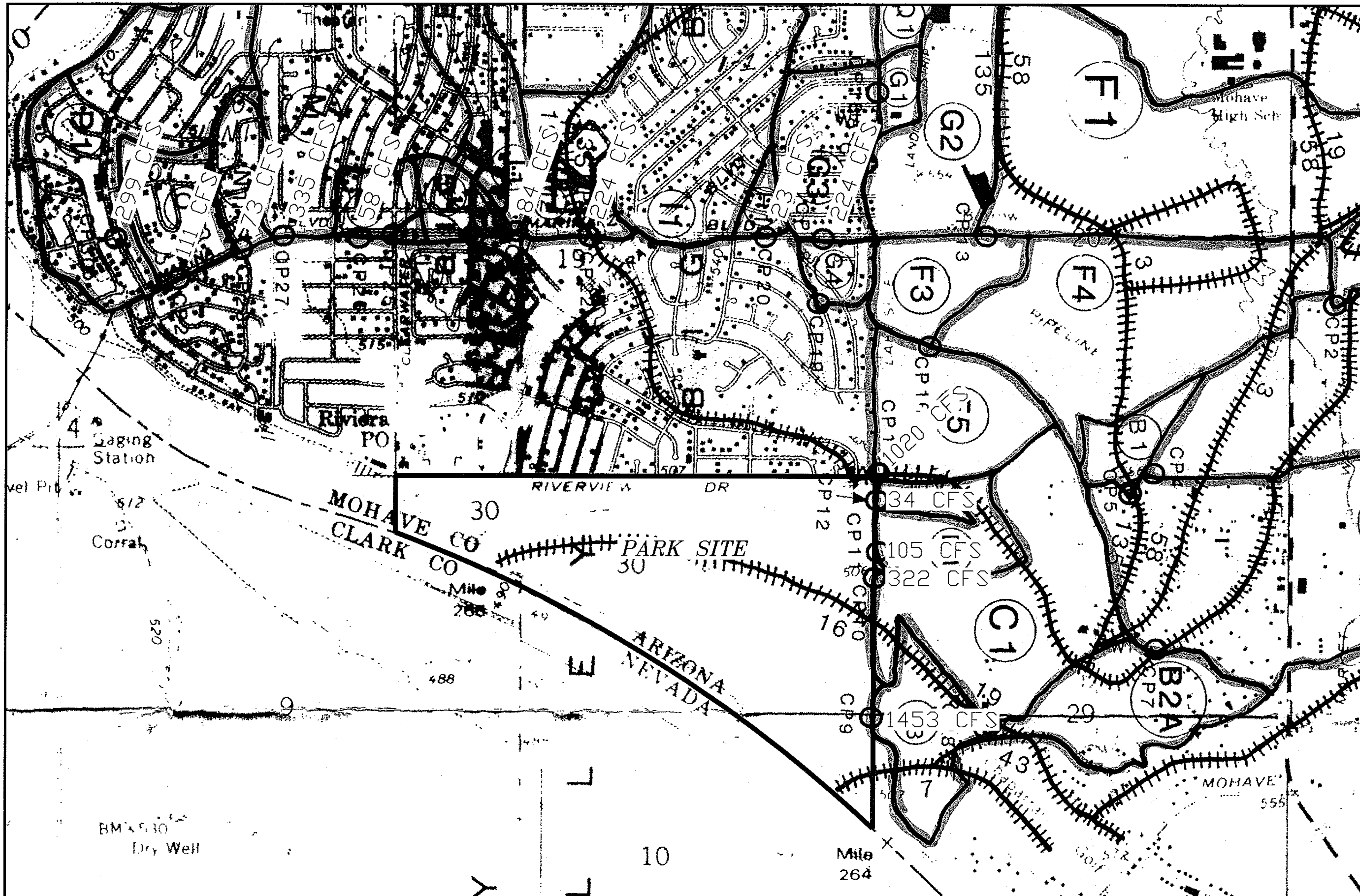
Exhibit 2, HEC-1 Offsite Drainage Map



SCALE 1"=500'

500 0 500 1000 1500

SCALE: 1"=500'

LEGEND

322 CFS 100-YEAR OFFSITE FLOWS

APPROXIMATE SITE BOUNDARY

LEGEND

(C1) DRAINAGE SUB-BASIN NUMBER C1

DRAINAGE SUB-BASIN BOUNDARY

19 SOIL MAP UNIT NO. 19

SOIL TYPE BOUNDARY

CP9 CONCENTRATION POINT NO. 9

O FLOW CONCENTRATION POINT

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

HEC-1 Offsite Drainage Map

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LAYOUT	DRAFTED	CHECKED
RDW	RDW	NEF

DRAWING SCALE(S): 1"=500 feet

PLAN DATE: October 2006

PROJECT NUMBER: 45102984

SHEET NO. 1 OF 1 SHEETS

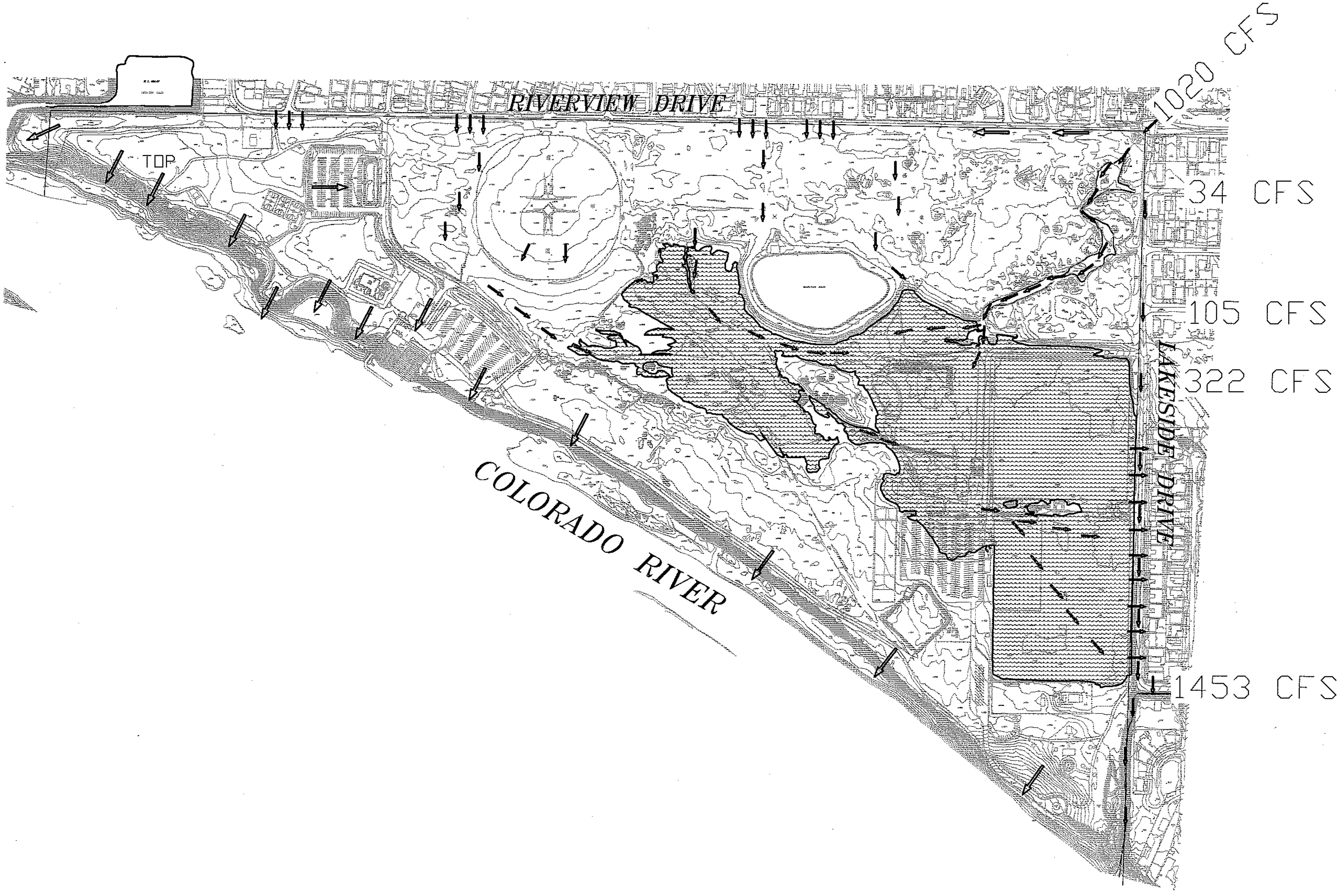
BURGESS & NIPLE
ENGINEERS ARCHITECTS

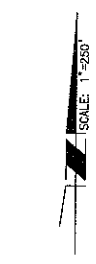
CITY OF BULLHEAD CITY, ARIZONA

MARINA BOULEVARD / LAKESIDE DRIVE ROADWAY IMPROVEMENTS

DRAINAGE ANALYSIS

Exhibit 3, Offsite Drainage Map (Existing Conditions)





250 0 250 500 750

SCALE: 1"=250'

LEGEND

1002	EXISTING GRADE CONTOURS
	FLOW DIRECTION
	APPROXIMATE SITE BOUNDARY
322 CFS	100 YEAR OFFSITE FLOWS
	PONDING AREA

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

Offsite Drainage Map
Existing Conditions

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LAYOUT	DRAFTED	CHECKED
RDW	RDW	NEF

DRAWING SCALE(S): 1"=250 feet

PLAN DATE: October 2006

PROJECT NUMBER: 45102984

SHEET NO. 1 OF 1 SHEETS

Exhibit 4, Offsite Drainage Map (Proposed Conditions)

LEGEND

1002	EXISTING GRADE CONTOURS
	FLOW DIRECTION
	APPROXIMATE SITE BOUNDARY
322 CFS	100 YEAR OFFSITE FLOWS
	CHANNEL

NO.	BY	DESCRIPTION	APP'D	DATE

REVISIONS

Offsite Drainage Map
Proposed Conditions

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LAYOUT	DRAFTED	CHECKED
RDW	RDW	NEF

DRAWING SCALE(S): 1"=250 feet

PLAN DATE: October 2006

PROJECT NUMBER: 45102984

SHEET NO. 1 OF 1 SHEETS

Exhibit 5, FlowMaster Output

Bullhead Rotary Park Channel
Worksheet for Triangular Channel

Project Description	
Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Left Side Slope

Input Data		
Mannings Coefficient	0.030	
Slope	0.010000	ft/ft
Depth	4.00	ft
Right Side Slope	8.00	H : V
Discharge	1,020.00	cfs

Results		
Left Side Slope	8.30	H : V
Flow Area	130.4	ft^2
Wetted Perimeter	65.68	ft
Top Width	65.19	ft
Critical Depth	3.96	ft
Critical Slope	0.010549	ft/ft
Velocity	7.82	ft/s
Velocity Head	0.95	ft
Specific Energy	4.95	ft
Froude Number	0.98	
Flow Type	Subcritical	

Culvert Analysis Report
WEIR

Analysis Component			
Storm Event	Check	Discharge	1,020.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	1,020.00 cfs	Check Discharge	1,020.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev	Velocity
Weir	Roadway	1,020.00 cfs	0.72 ft	N/A

Culvert Analysis Report
WEIR

Component:Weir

Hydraulic Component(s): Roadway			
Discharge	1,020.00 cfs	Allowable HW Elevation	0.72 ft
Roadway Width	25.00 ft	Overtopping Coefficient	3.00 US
Low Point	0.00 ft	Headwater Elevation	0.72 ft
Discharge Coefficient (Cr)	3.00	Submergence Factor (Kt)	1.00
Tailwater Elevation	-9,999.00 ft		

Sta (ft)	Elev (ft)
0.00	5.00
100.00	0.00
650.00	0.00
750.00	5.00