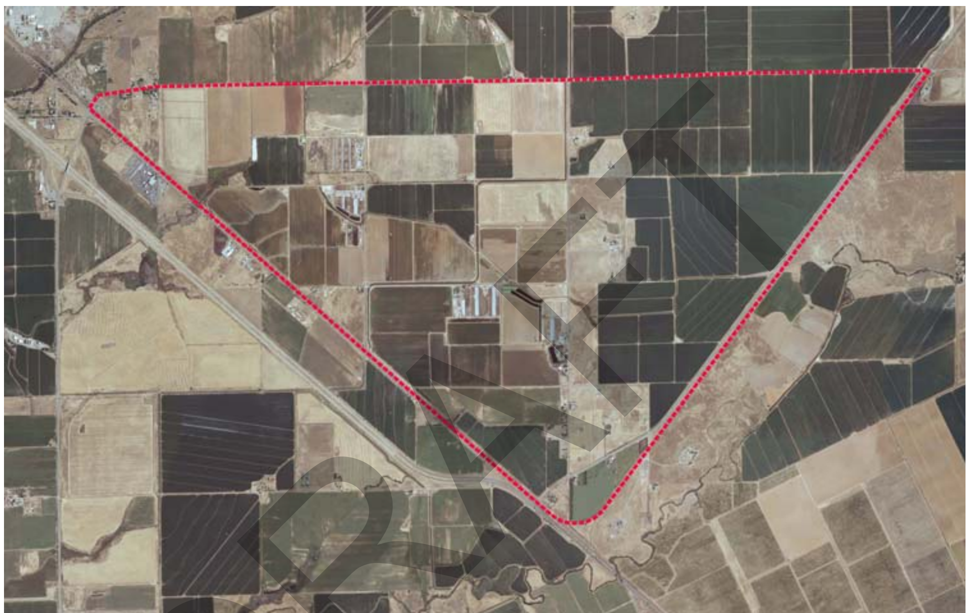
TECHNICAL MASTER PLAN

STATE ROUTE 65 EMPLOYMENT VILLAGE INFRASTRUCTURE



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Prepared for:

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Community Development and Services Agency
915 8th Street
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April 30, 2013

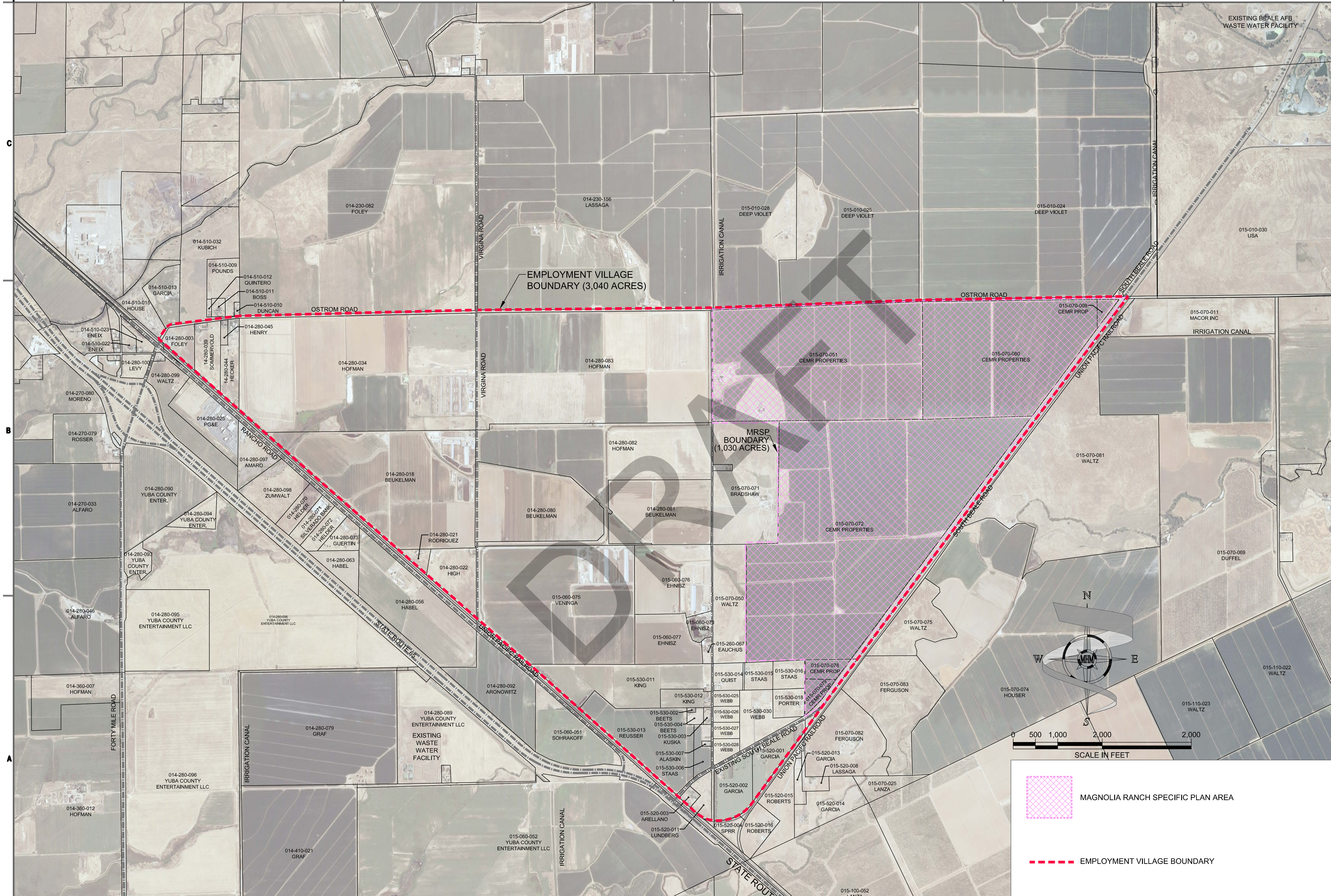
THE TECHNICAL MASTER PLAN CONTAINED HERE HAS BEEN PREPARED BY OR UNDER THE DIRECTION OF THE FOLLOWING REGISTERED PERSON.

Sean Minard, P.E., P.L.S.
C 52593 EXPIRES 12/31/2014
L 8331 EXPIRES 03/31/2014

Introduction

The State Route 65 Employment Village covers an area of roughly 3,040 acres off of State Route 65 west of the Union Pacific Railroad between Ostrom Road and South Beale Road. The Yuba County designated this area in the 2030 General Plan with the intent to facilitate the development of job-producing uses in the Highway 65 corridor in a mixed-use environment. The boundary of the Employment Village is shown in Figure A. The allowed land uses within this boundary primarily include light and general industrial, manufacturing, research and development, warehousing, rail-dependent uses, transportation/logistics, offices, agriculture related and agricultural processing; cultural, educational, medical, and other institutional uses. Retail, services, and housing (and mixed-use with housing) is allowed east of Bradshaw Road. These uses contribute to and help construct infrastructure needed to serve the primary employment-generating uses. The Magnolia Ranch Specific Plan (MRSP) that covers roughly 1,030 acres and is located east of Bradshaw Road, will be the first phase of development and infrastructure construction in the State Route 65 Employment Village. This will bring in the initial backbone infrastructure for the Employment Village Area. The proposed land uses for the Employment Village area and the MRSP are shown in Figure B.

The purpose of the Technical Master Plan is to layout the infrastructure needed to support the SR 65 Employment Village. The infrastructure items covered within this document are transportation, sewer, water, and storm drainage. Section 1 is dedicated to the transportation infrastructure and covers the roadway improvements required to support the vehicular and bicycle traffic within the Employment Village. Section 2 is dedicated to sewer infrastructure and focuses on the major sewer facilities required to collect the entire sewer runoff generated within Employment Village and convey it to the Olivehurst Public Utilities (OPUD) waste water facility. Section 3 is dedicated to the water infrastructure can covers the new wells, storage, and conveyance system required to support the Employment Village that will be operated and maintained by OPUD. Section 4 is dedicated to storm drainage infrastructure and analyzes the storm drainage pipes, channels, and ponds required to collect the runoff from the development of the Employment Village and mitigate the downstream runoff so that it is not increased. Finally Section 5 looks at the phasing of all these improvements and how they tie together with Magnolia Ranch Specific Plan development.



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Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:
Rev. 100%

FIGURE A
LOCATION MAP

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE A

Dwg.:13-122

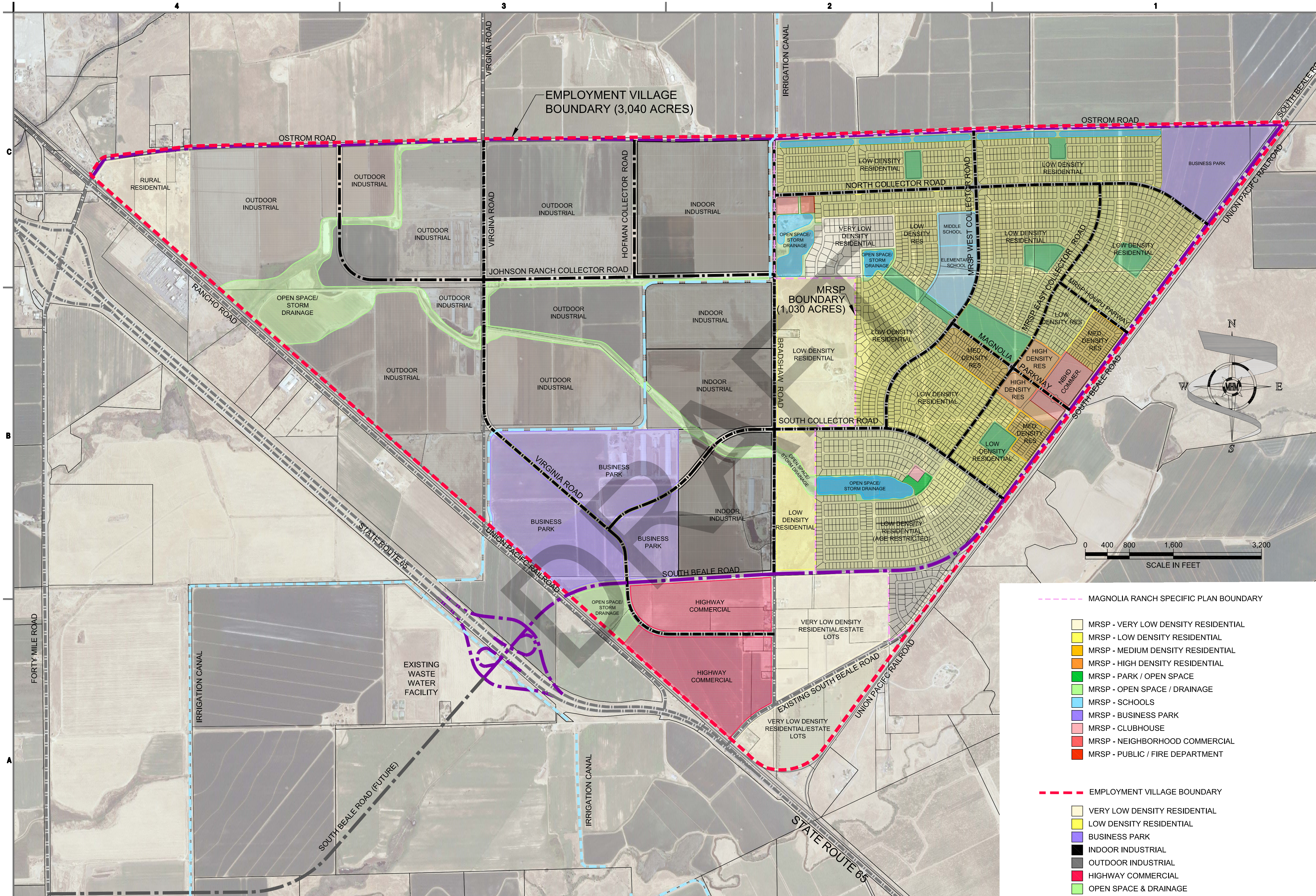

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FIGURE B
LAND USE MAP

Job Title:
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FIGURE B

Dwg.:13-122

1 - Transportation Infrastructure

1.1 Existing Facilities

The State Route 65 Employment Village triangular area is currently bordered on two of the three sides by South Beale Road and Ostrom Road. These two roads provide the connection from the Village area to State Route 65 and Beale Air Force Base. Ostrom Road currently connects to State Route 65 through the Forty Mile Road / Ostrom Road interchange. South Beale Road currently connects to State Route 65 with at grade intersection with stop signs on South Beale Road. Currently South Beale Road and Ostrom Road are just conventional rural two lane roads without bicycle lanes.

There are currently only two roads that provide circulation within the Village area. Virginia Road runs north-south in the west half of the Village area providing circulation between Ostrom Road and Rancho Road. Bradshaw Road runs north-south near the middle of the Village area providing a circulation between Ostrom Road and South Butte Road. These roads also are conventional rural two lane roads without bicycle lanes.

1.2 Traffic Study Summary

The State Route 65 Employment Village was part of the 2030 General Plan traffic analysis performed by Fehr and Peers and incorporated in the 2030 General Plan EIR. In the traffic analysis, the only road specifically analyzed under the existing condition was South Beale Road it was identified as a collector road. The intersection of South Beale Road and State Route 65 was identified in the study as currently operating at a Level of Service (LOS) D during PM peak hour. Previous traffic and safety issues warranted the conversion of the intersection of Ostrom Road and South Beale Road to a four-way stop in 2010.

The 2030 General Plan traffic study did analyze the development of the State Route 65 Employment Village under the 2030 General Plan Growth Scenario 2 (Alternative 4). Under this scenario the LOS of the South Beale Road intersection with State Route 65 was modeled to degrade to a LOS F.

1.3 Road Improvements

The General Plan designates Ostrom Road and South Beale Road as becoming two lane major arterials with South Beale Road being expanded to four lanes between Bradshaw Road and State Route 65. The General Plan also designated upgrading the intersection of South Beale Road and State Route 65 to an interchange and extending South Beale Road west of the State Route 65 to Forty Mile Road.

One of the main goals of the traffic circulation infrastructure plan is the elimination of the at-grade crossings of the railroad. The Employment Village plan area current has three at-grade crossings at Ostrom Road, South Beadle Road, and Virginia Road. As the employment Village develops, the crossings will be reduced to a single crossing at Ostrom Road. The Virginia Road crossing will be eliminated when the south end of the road is re aligned and extended to South Beale Road. The South Beale Road crossing will be eliminated when the road is realigned to a new interchange with State Route 65 via a railroad overcrossing. The Employment Village area build out traffic circulation will be primarily to the new South Beadle Road Interchange and the remaining at-grade Ostrom Road crossing traffic levels will be reduced below the current levels.

Existing Virginia Road and Bradshaw Road will be upgraded to urban collector roads as the Employment Village Develops. The Magnolia Ranch Specific Plan also identifies the addition of six new internal collector streets proposed within the Specific Plant area: North Collector Road, South Collector Road, East Collector Road, West Collector Road, Houpu Parkway, and Magnolia Parkway. The Parkways are similar to the other collectors but also include additional landscape areas and a landscape median. Additional collector roads outside the MRSP will be needed to provide circulation within the Employment Village. These collectors will be provided by the addition of two new collector roads, extending and realigning and extending Virginia Road, and extending the South Collector Road from the MRSP through the Employment Village Area to Virginia Road.

Additional minor roads will be incorporated as part of the development of the Employment Village area. The minor Roads that have been laid out has part of the MRSP are shown on the attached Figure 1-1. Once completed, Employment Village area will consist of a street network connecting internally and externally in all directions for all modes of transportation. The proposed circulation plan is shown in Figure 1-1

All roadway improvements will consist of curb, gutter, sidewalk, asphalt, and landscape area. On roads adjacent to residential lots the improvements will also include an additional landscape area and decorative masonry block wall. The following is a description and timing of the key roadway improvements required for the State Route 65 Employment Village: (not listed in any defined order)

<u>South Beale Road Improvements – Ostrom Road to South Collector Road (8,500')</u> – The existing road will be widened to an urban / rural arterial road. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, landscape island, a masonry block wall on the west side adjacent to proposed homes, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the MRSP development adjacent to that section of road. The intersection of Ostrom Road and South Beale Road will be signalized, when the warrants for the signalization are met.

<u>South Beale Road Improvements –South Collector Road to Bradshaw Road (4,700')</u> – A new realigned section of 2 lane arterial road will be constructed. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, landscape island, a masonry block wall side adjacent to proposed homes, water, storm sewer, drainage, and other improvements required by the County. These improvements will be developed in conjunction with the MRSP development adjacent to that section of road. The intersection of South Beale Road and Bradshaw Road will be signalized, when the warrants for the signalization are met.

<u>South Beale Road Improvements – Bradshaw Road to Virginia Road (2,700')</u> – A new realigned section of 4 lane urban arterial road will be constructed. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm sewer, drainage, and other improvements required by the County. These improvements will be developed in conjunction with the development of the Southern Portion of the Employment Village or when the LOS at the intersection of South Beale Road and State Route 65 warrants replacement. The intersection of South Beale Road and Virginia Road will be signalized, when the warrants for the signalization are met.

<u>South Beale Road Improvements – Virginia Road to State Route 65 (3,300')</u> – A new realigned section of 4 lane urban arterial road will be constructed elevated over the

existing railroad tracks and Rancho Road connecting to a new interchange with State Route 65. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm sewer, drainage, and other improvements required by the County. When the new interchange is complete, the original alignment of South Beale Road will be terminated in a cul-de-sac prior to State Route 65. These improvements will be required to be developed when the LOS at the intersection of South Beale Road and State Route 65 warrants replacement.

<u>Ostrom Road Improvements – Bradshaw Road to South Beale Road (9,200’)</u> – The existing road will be widened to an urban / rural arterial road. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, a masonry block wall on the south side adjacent to proposed homes, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the MRSP development adjacent to that section of road.

<u>Ostrom Road Improvements – Rancho Road to Bradshaw Road (12,600’)</u> – The existing road will be widened to an urban / rural arterial road. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the development of the adjacent portion of the Employment Village. The intersection of Ostrom Road and Rancho Road will be signalized the, when warrants for the signalization are met.

<u>Bradshaw Road Improvements – Ostrom Road to Realigned South Beale Road (7,900’)</u> – The existing road will be widened to an urban collector road. The improvements include curb, gutter, asphalt, sidewalk, a class II bike lane, landscape strip, left turn pockets, a masonry block wall on the east side adjacent to proposed homes, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the MRSP or Employment Village development adjacent to that section of road.

<u>Bradshaw Road Improvements –Realigned South Beale Road to Existing South Beale Road (2,400’)</u> – The existing road will be widened to urban road standards along any development that occurs in this area of the Employment Village. The improvements

include curb, gutter, asphalt, sidewalk, a class II bike lane, landscape strip, water, storm drainage, and other improvements required by the County.

Virginia Road Improvements – Ostrom Road to the Irrigation Canal (5,400') – The existing road will be widened to an urban collector road. The improvements include curb, gutter, asphalt, sidewalk, a class II bike lane, landscape strip, a left turn pockets, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the Employment Village development adjacent to that section of road.

Virginia Road Improvements – The Irrigation Canal to Bradshaw Road (7,100') – A new realigned section of collector road will be constructed connecting up with the planned South Collector Road, the planned realigned South Beale Road, and curve down to connect with Bradshaw Road. The improvements include curb, gutter, asphalt, sidewalk, a class II bike lane, landscape strip, a left turn pockets, water, storm drainage, and other improvements required by the County. These improvements will be developed in conjunction with the Employment Village development adjacent to that section of road and the existing Virginia Road Connection to Rancho Road will be removed as soon as Virginia Road is connected to the South Collector Road.

Johnson Ranch Collector Road Improvements – Ostrom Road to Bradshaw Road (10,000') – This new unloaded collector road will be developed with the north portion of the Employment Village providing circulation to the arterials from the center of this area. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm drainage, and other improvements required by the County.

Hofman Collector Road Improvements – Johnson Ranch Collector Road to Ostrom Road (2,500')– This new unloaded collector road will be developed with the north portion of the Employment Village providing circulation to the arterials from the center of this area. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm drainage, and other improvements required by the County.

North Collector Road Improvements – Bradshaw Road to South Beale Road (8,100') – This new unloaded collector road will be developed with the north portion of the MRSP providing circulation to the arterials. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, a masonry block wall adjacent to proposed homes, water, storm drainage, and other improvements required by the County.

South Collector Road Improvements – Bradshaw Road to South Beale Road (4,600') – This new unloaded collector road will be developed with the south portion of the MRSP providing circulation to the arterials. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, a masonry block wall adjacent to proposed homes, water, storm drainage, and other improvements required by the County.

South Collector Road Improvements – Virginia Road to Bradshaw Road (3,700') – This new unloaded collector road will be developed with the adjacent portion of the Employment Village providing circulation to the arterials. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, water, storm drainage, and other improvements required by the County.

West Collector Road Improvements – South Collector Road to Ostrom Road (6,000') – This new loaded and unloaded collector road that will be developed in phases corresponding with MRSP phases providing circulation through the MRSP and connecting the North and South Collector Roads. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, a masonry block wall adjacent to proposed homes, water, storm drainage, and other improvements required by the County.

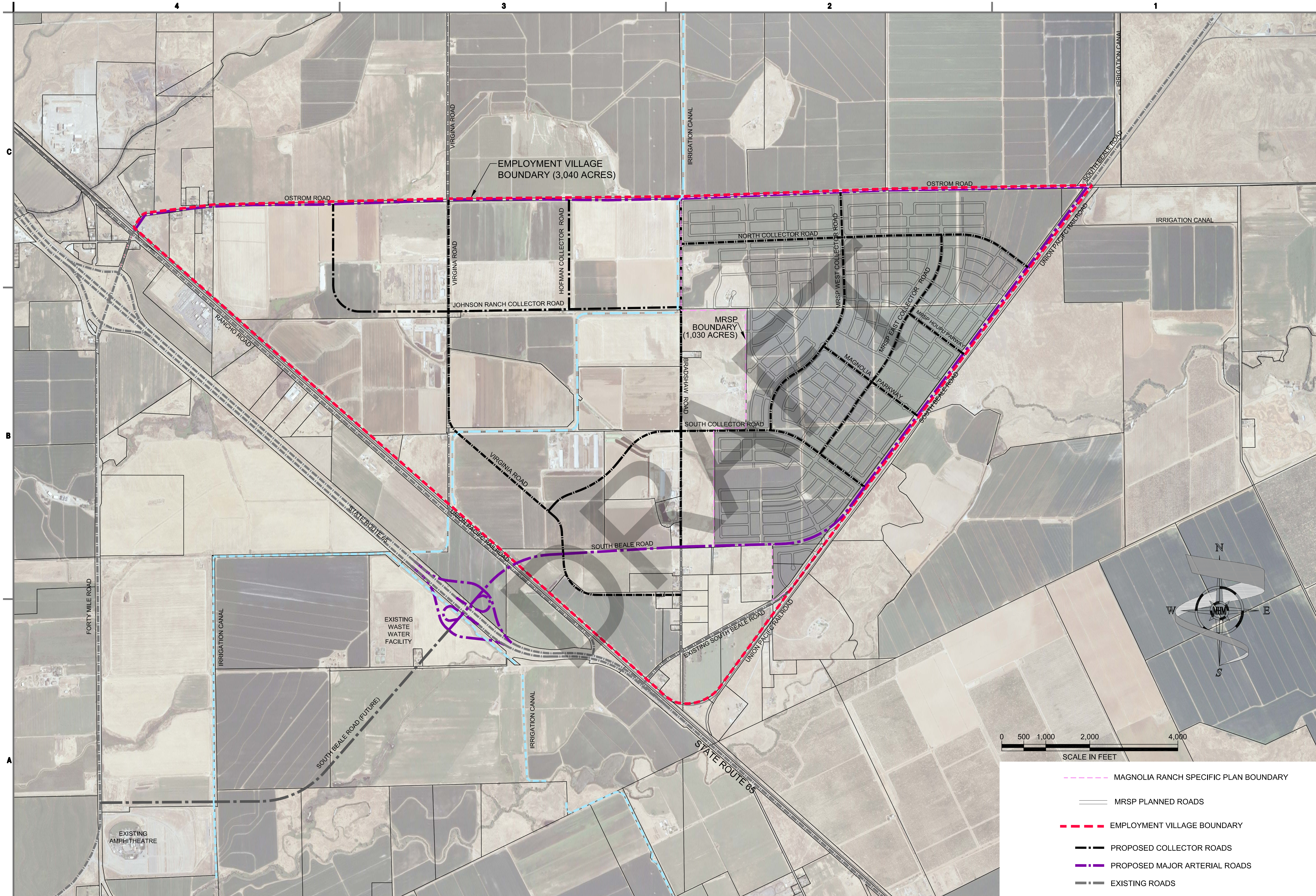
East Collector Road Improvements – South Collector Road to North Collector Road (5,800') – This new loaded and unloaded collector road that will be developed in phases corresponding with MRSP phases providing circulation through the MRSP and connecting the North and South Collector Roads. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscape strip, a turn lane, a masonry block wall adjacent to proposed homes, water, storm drainage, and other improvements required by the County.

Houpu Parkway Improvements – East Collector Road to South Beale Road (1,500’) – This new loaded collector road that will be developed with the adjacent MRSP will provide a parkway and additional connection between the East Collector Road and North Beale Road. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscaped median, landscape strip, water, storm drainage, and other improvements required by the County.

Magnolia Parkway Improvements – West Collector Road to South Beale Road (2,700) – This new loaded collector road with be the entrance to the center of the MRSP that will be developed with the adjacent MRSP. The improvements include curb, gutter, asphalt, sidewalk, a class I detached bike path, landscaped median, landscape strip, water, storm drainage, and other improvements required by the County.

1.4 Phasing

The phasing of the roadway improvement will be dictated by rate and manner that the Employment Village area develops. The first phase of the development of MRSP will rely mainly on Ostrom Road for circulation and will likely trigger the warrant for the signalization of the Ostrom Road and Rancho road intersection before build out. As the MRSP continues to develop and other area in the Employment Village begin developing the existing intersection of State Route 65 and South Beale Road may warrant signalization. This intersection will be upgraded to a signal to service the area until the realigned portion of South Beale Road and new interchange is developed.



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Date: 04-30-13
Design file no: 13122
Drawing Code:
File name:
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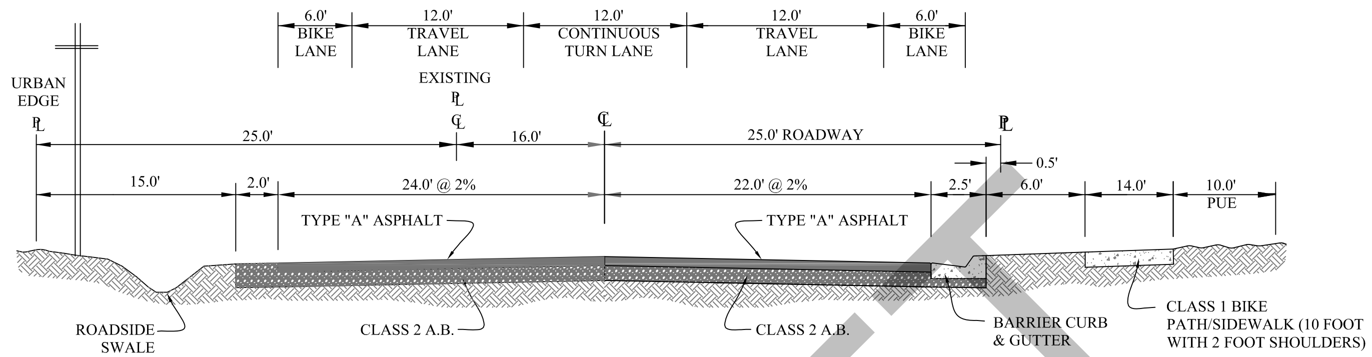
FIGURE 1-1
CIRCULATION PLAN

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

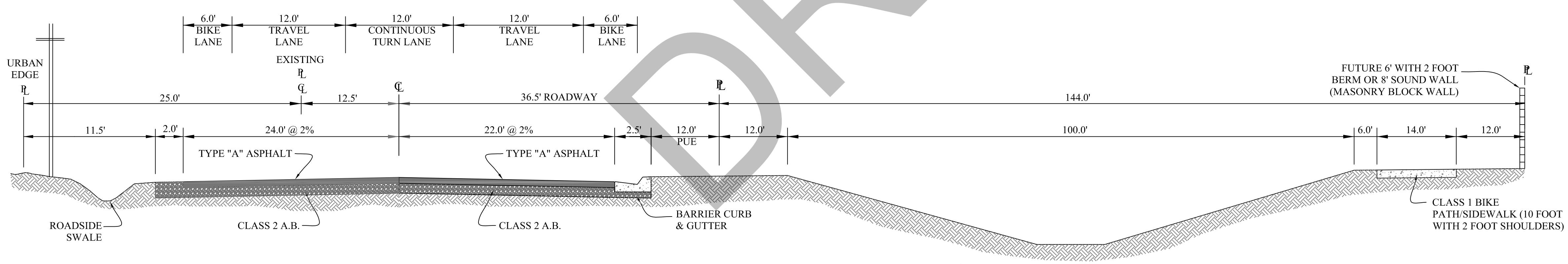
Drawing reference number
FIGURE 1-1

Dwg.:13-122



OSTROM ROAD (TYPICAL) - 66.0' R/W

NOT TO SCALE
OSTROM ROAD - LOOKING EAST



OSTROM ROAD (MRSP DETENTION POND) - 74.0' R/W

NOT TO SCALE
OSTROM ROAD - LOOKING EAST

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FIGURE 1-2
TYPICAL ROAD SECTIONS
ARTERIAL - OSTRO,M ROAD

Job Title:
TECHNICAL MASTER PLAN FOR:
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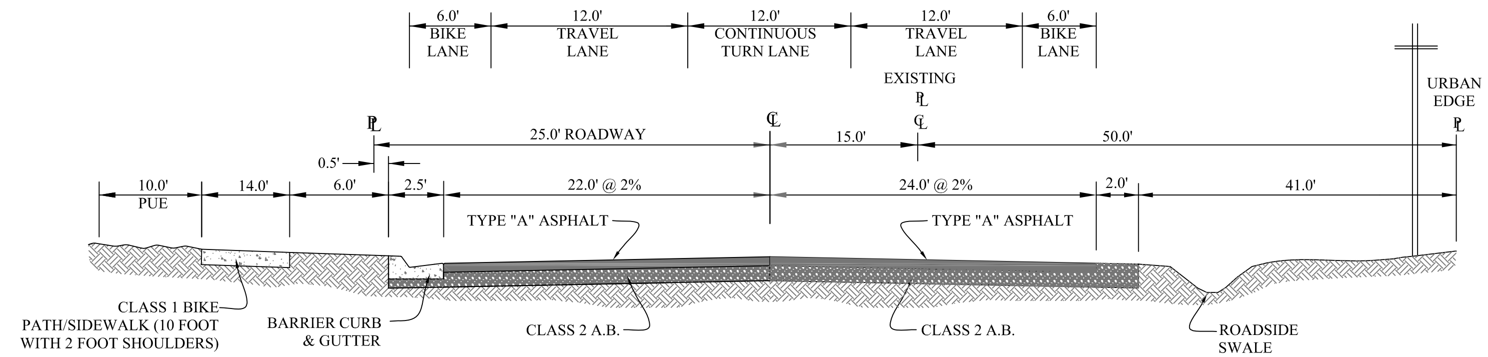
County of Yuba
Community Development and Services Agency

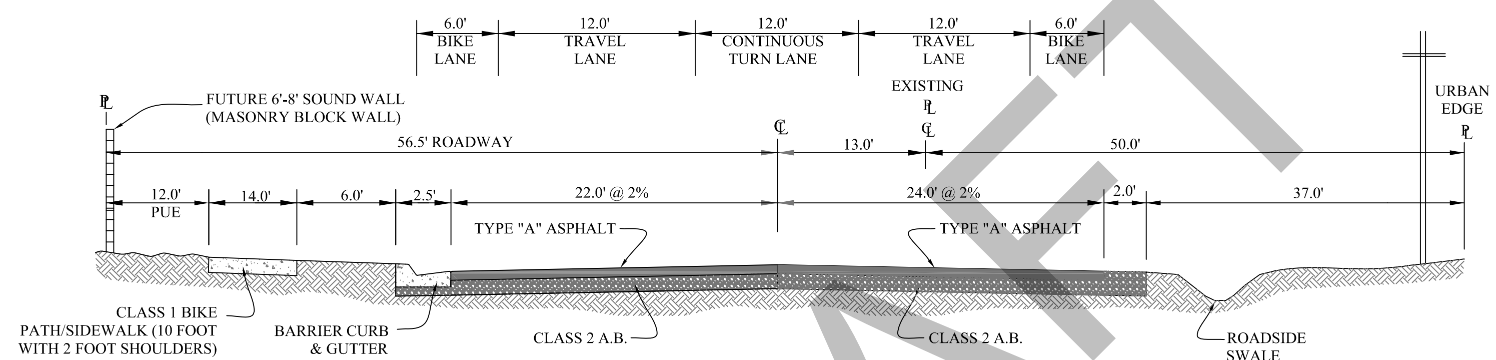
Drawing reference number
FIGURE 1-2

Dwg.:13-122



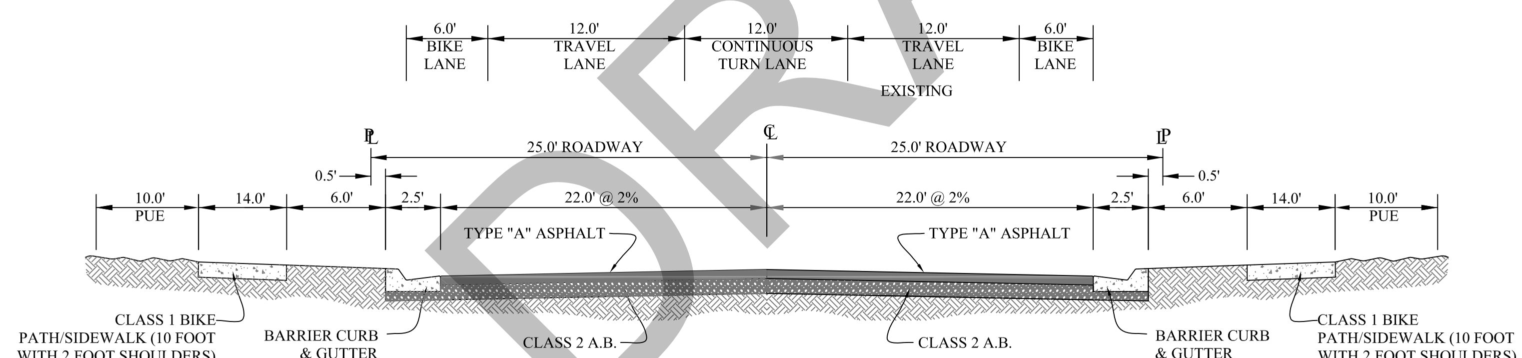
MRSP SOUTH BEALE ROAD (BUSINESS PARK/COMMERCIAL) - 90.0' R/W

NOT TO SCALE
SOUTH BEALE ROAD - LOOKING NORTH



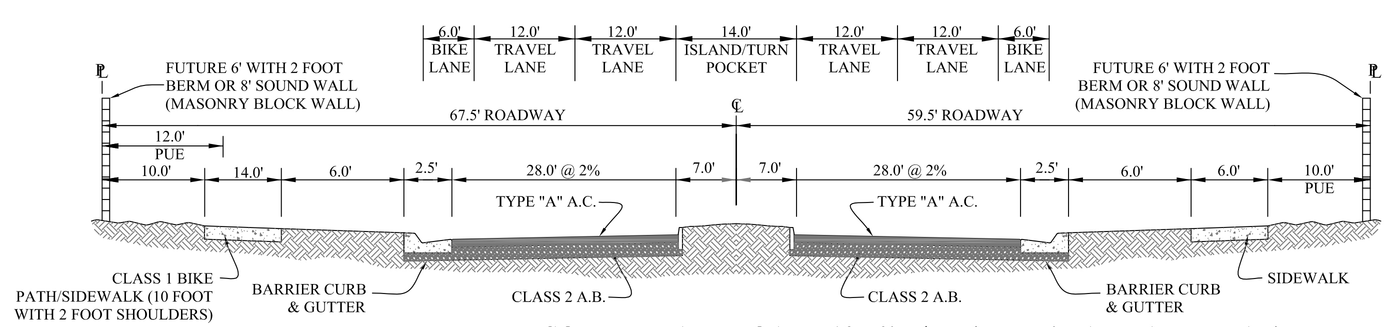
MRSP SOUTH BEALE ROAD (SINGLE FAMILY RESIDENTIAL) - 119.5' R/W

NOT TO SCALE
SOUTH BEALE ROAD - LOOKING NORTH



MRSP SOUTH BEALE ROAD (NEW ALIGNMENT) - 50.0' R/W

NOT TO SCALE
SOUTH BEALE ROAD - LOOKING NORTH



SOUTH BEALE ROAD - 127.0' R/W (NEW 4 LANE ARTERIAL)

NOT TO SCALE
SOUTH BEALE ROAD - LOOKING EAST

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FIGURE 1-3
TYPICAL ROAD SECTIONS
SOUTH BEALE ROAD

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FIGURE 1-3

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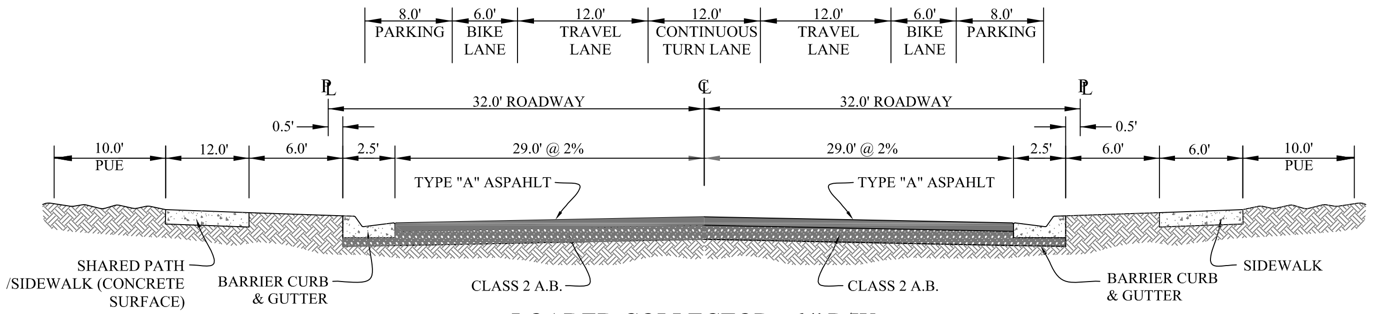
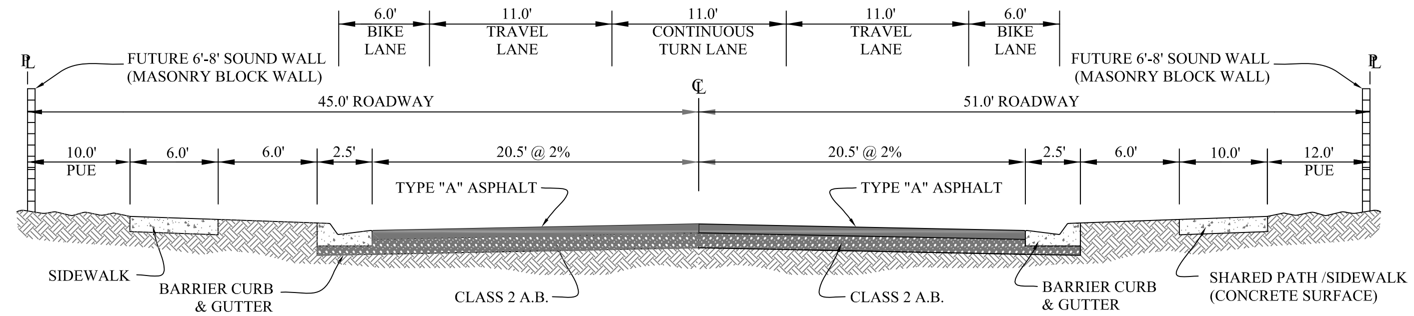


LOADED COLLECTOR - 64' R/W

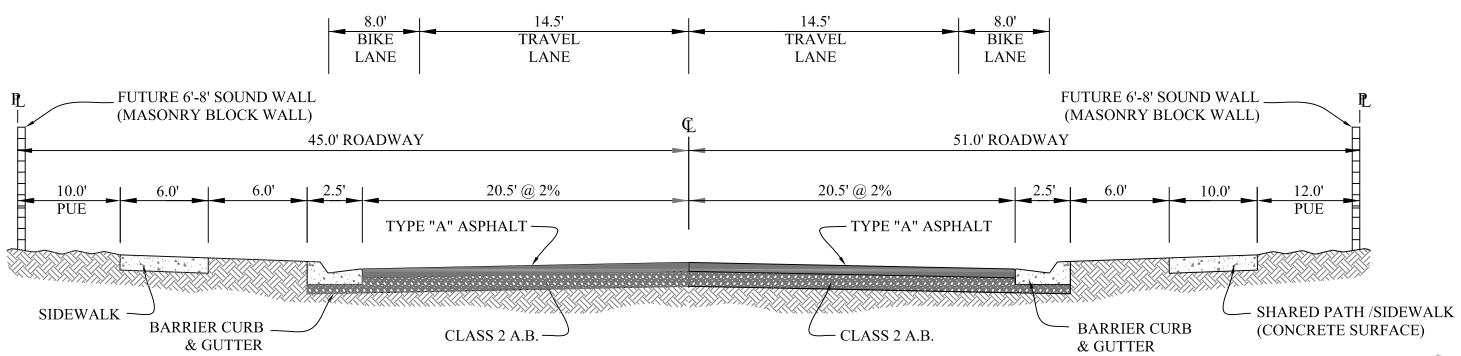
NOT TO SCALE
SCHOOL FRONTAGE - LOOKING NORTH
COMMUNITY PARK FRONTAGE - LOOKING EAST



UNLOADED COLLECTOR - 96' R/W

NOT TO SCALE
TYPICAL SECTION IS FOR RESIDENTIAL AREAS. SEE NOTE FOR COMMERCIAL, PUBLIC FACILITY, AND BUSINESS PARK FRONTAGE.

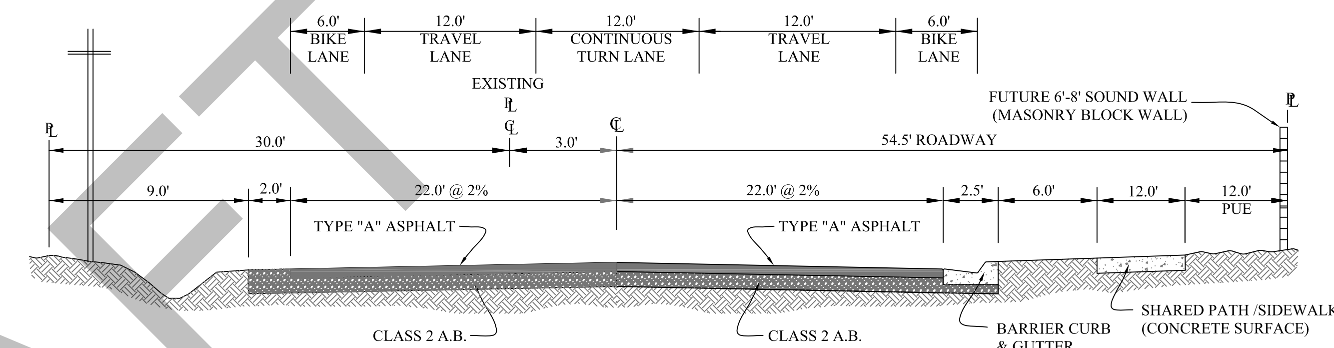
NOTE: IN AREAS ADJACENT TO THE COMMERCIAL, BUSINESS PARK, PUBLIC FACILITY, PARK PARCELS, THERE SHALL BE NO MASONRY BLOCK REQUIRED. THE PROPERTY LINE SHALL BE LOCATED ONE-HALF (½) FOOT BEHIND CURB SIMILIAR TO TYPICAL INTERIOR STREET ROAD SECTION.



UNLOADED COLLECTOR - 96' R/W

NOT TO SCALE
TYPICAL SECTION IS FOR RESIDENTIAL AREAS. SEE NOTE FOR COMMERCIAL, PUBLIC FACILITY, AND BUSINESS PARK FRONTAGE.

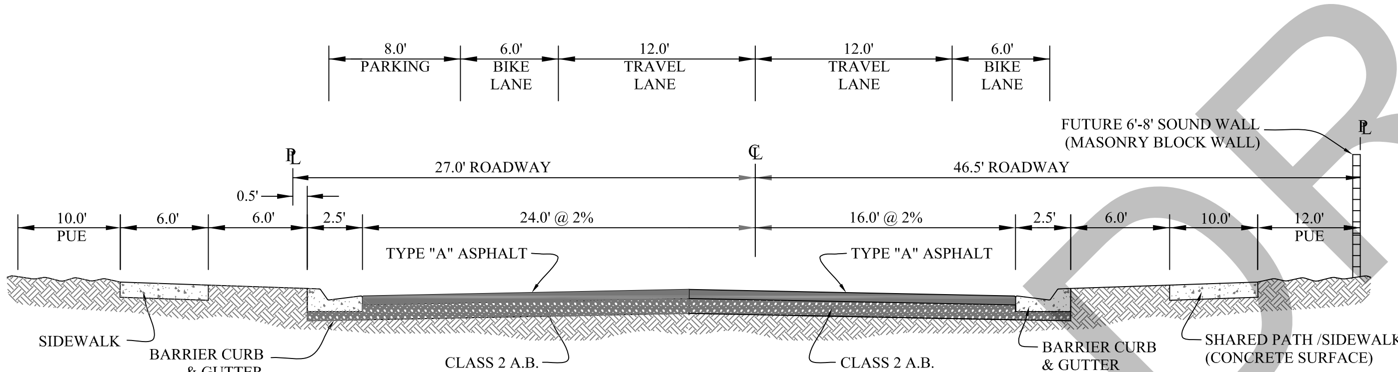
NOTE: IN AREAS ADJACENT TO THE COMMERCIAL, BUSINESS PARK, PUBLIC FACILITY, PARK PARCELS, THERE SHALL BE NO MASONRY BLOCK REQUIRED. THE PROPERTY LINE SHALL BE LOCATED ONE-HALF (½) FOOT BEHIND CURB SIMILIAR TO TYPICAL INTERIOR STREET ROAD SECTION.



COLLECTOR - 87.5' R/W

NOT TO SCALE
TYPICAL SECTION IS FOR RESIDENTIAL AREAS. SEE NOTE FOR COMMERICAL AND DETENTION POND FRONTAGE.

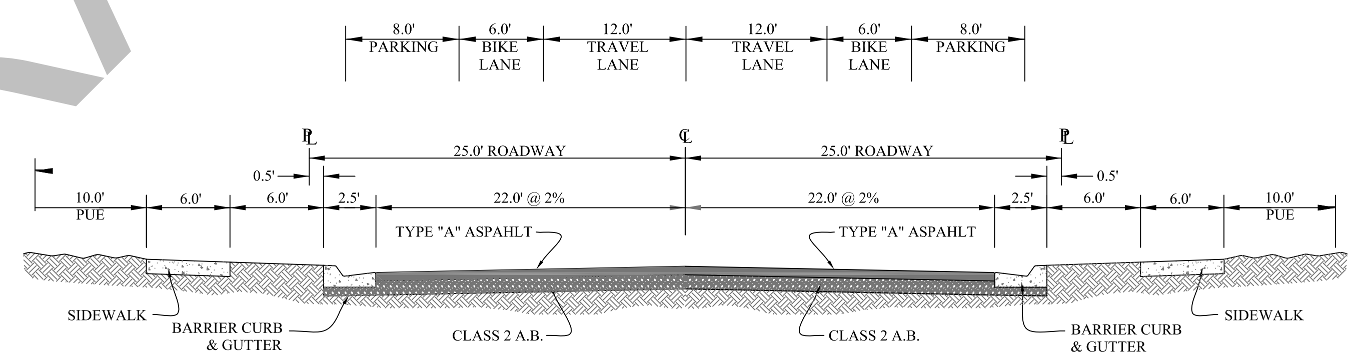
NOTE: IN AREAS ADJACENT TO THE COMMERCIAL AND DETENTION POND, THERE SHALL BE NO MASONRY BLOCK REQUIRED. THE PROPERTY LINE SHALL BE LOCATED ONE-HALF (½) FOOT BEHIND CURB SIMILIAR TO TYPICAL INTERIOR STREET ROAD SECTION.



LOADED/UNLOADED COLLECTOR - 73.5' R/W

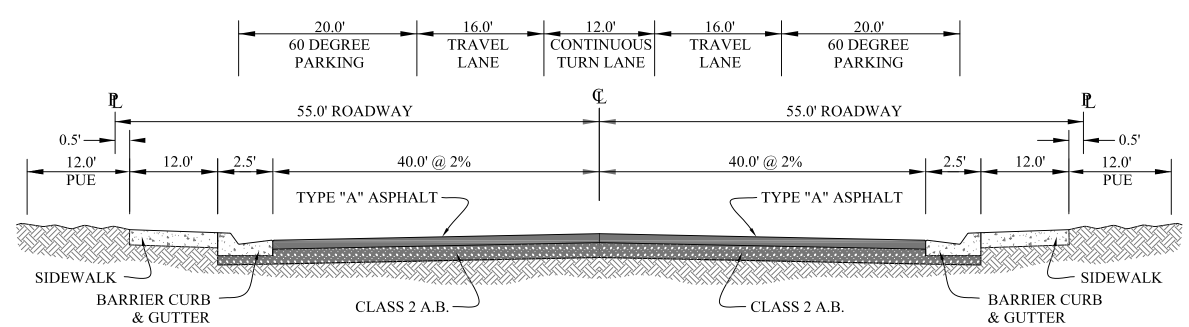
NOT TO SCALE
TYPICAL SECTION IS FOR RESIDENTIAL AREAS. SEE NOTE FOR BUSINESS PARK FRONTAGE.

NOTE: IN AREAS ADJACENT TO BUSINESS PARK, THERE SHALL BE NO MASONRY BLOCK REQUIRED. THE PROPERTY LINE SHALL BE LOCATED ONE-HALF (½) FOOT BEHIND CURB SIMILIAR TO TYPICAL INTERIOR STREET ROAD SECTION.



LOADED COLLECTOR - 50' R/W

NOT TO SCALE



MAIN STREET COLLECTOR - 110' R/W

NOT TO SCALE
TYPICAL SECTION IS FOR COMMERCIAL. THE CROSS SECTION INCLUDE SIXTY (60) DEGREE PARKING ON EACH SIDE OF ROADWAY.

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FIGURE 1-4
TYPICAL ROAD SECTIONS
COLLECTOR ROADS

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State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

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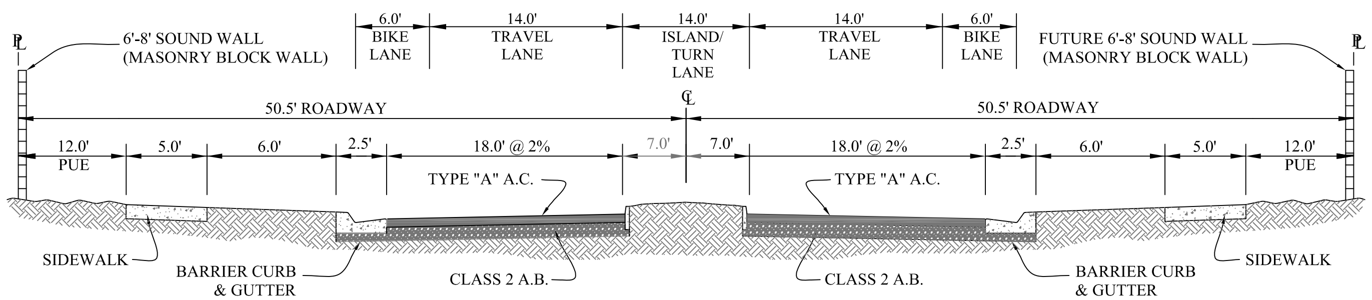
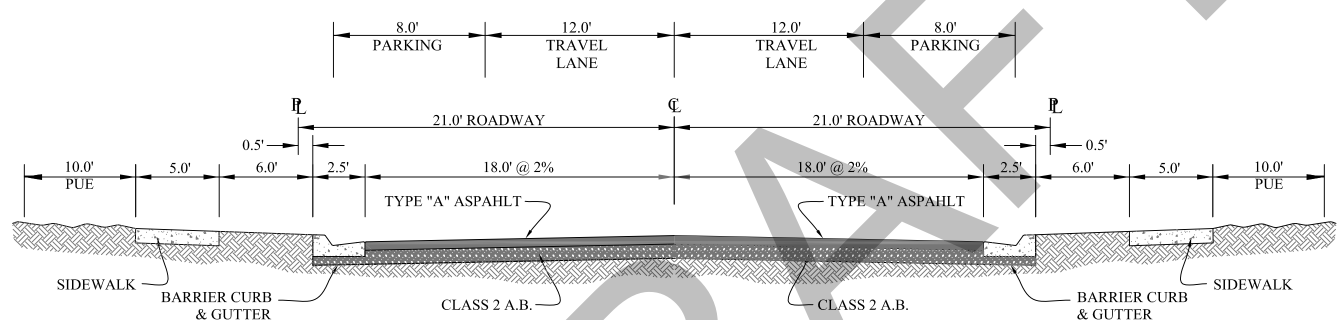
FIGURE 1-4

Dwg.:13-122



RESIDENTIAL ENTRANCE - 101'

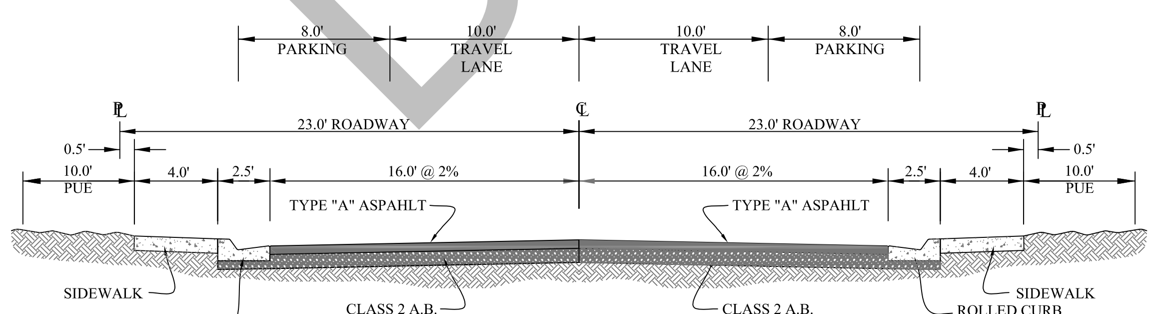
NOT TO SCALE
VILLAGE ENTRANCE



PRIMARY RESIDENTIAL - 42' R/W

NOT TO SCALE
ALL INTERIOR ROADS SERVING MORE THAN 100 LOTS BUT NO MORE THAN 500

NOTE: AS AN OPTION, THE PROPERTY LINE COULD BE LOCATED ONE-HALF (½) FOOT BEHIND CURB WITH PEDESTRAIN EASEMENT TO BACK OF SIDEWALK.



MINOR RESIDENTIAL - 46' R/W

NOT TO SCALE
ALL INTERIOR ROADS SERVING 100 OR FEWER LOTS

NOTE: THE SPECFIC PLAN SHALL INCLUDE A TREE PLANTING REQUIREMENT FOR THE FRONT YARDS SIMILAR TO A TREE PLANTING LAYOUT FOR DEATTACHED SIDEWALKS. TREES SHALL BE LOCATED BETWEEN 10 AND 15 FEET BEHIND SIDEWALK (OUTSIDE OF PUE) AND PLANTED NO FURTHER THAN 30 FEET APART).

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Rev: 100%
Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:

FIGURE 1-5
TYPICAL ROAD SECTIONS
RESIDENTIAL ROADS

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 1-5

Dwg.:13-122

2 - Sanitary Sewer Infrastructure

2.1 Existing Facilities

This State Route 65 Employment Village area currently does not have any public sewer facilities. The existing residences and business within the Employment Village area are supported by individual onsite wastewater systems. There are some existing public sewer facilities near the Employment Village as follows. To the northeast of the Village Area, the Beale Air Force Base waste water treatment facility is located adjacent to South Beale Road. To the southwest of the Village Area, the sports and entertainment wastewater treatment facility located on Morrison Road currently supports the amphitheater. The Olivehurst Public Utilities District (OPUD) waste water treatment facility is located at the south end of Olivehurst, just west of State Route 70. The Employment Village is located within OPUD Sphere of Influence and their waste water treatment facility is the closest that could support the development of the Employment Village without extensive expansion. The OPUD waste water facility is permitted to 3.0 MGD with an allowed expansion discharge to 5.0 MGD with additional treatment of the effluent. The current average flow into the waste water facility is near 1.5 MGD. The OPUD waste water treatment facility as constructed has the following capacities: 9.7 MGD peak hour, 6.8 MGD peak day, and 4.6 MGD peak month.

2.2 Sewer System Analysis

A Pre-Design Analysis was prepared for use as an aid in determining new sewer infrastructure required to support the Employment Village. The intent of this analysis is to review and assess existing information and to determine possible infrastructure improvements. The goals of the analysis are as follows:

- Determine the geometric and hydraulic design parameters.
- Prepare and analyze project objectives with approval from: OPUD, Yuba County and the developers of the Magnolia Ranch Specific Plan.
- Prepare design calculations and schematic design.
- Prepare a conceptual design

2.2 Sewer System Design Criteria

The design of a domestic sanitary sewer system depends on many factors, some of which can be measured with a fair degree of precision and others which rely upon engineering judgment. This section of the report discusses the parameters required to design a domestic sanitary sewer system acceptable to OPUD, Yuba County, and the Employment Village developers. A domestic sanitary sewer system has five major elements as follows:

1. A Wastewater Treatment Plant. The wastewater treatment plant, located in south end of the Olivehurst area, removes constituents in the wastewater by physical, chemical, and biological means.

2. A network of underground gravity flow pipelines which are directly connected to the source (i.e. house, office, store, etc) without any pretreatment. The gravity flow pipelines convey the wastewater from the area of generation to the wastewater treatment plant.

3. Pump/Lift Stations. The gravity flow pipelines convey the wastewater from the area of generation to the pump station, which will lift the wastewater to allow gravity flow to the wastewater treatment plant.

4. Access to main lines. A system of manholes shall be installed for used by OPUD to maintain and service the underground pipes.

5. A management, operating, and maintenance group.

The emphasis of this pre-design analysis is element numbers 2 and 3. Element 4 will be provided internally as part of the improvement plans for each development project and Elements 1 and 5 are provided by OPUD.

2.3 General Design Considerations

Numerous considerations were made to produce a conceptual design. OPUD currently does not have detailed standards for estimating sewage flows and designing collection sewer systems, but the OPUD standards do reference the most current adopted Sacramento Area

Sewer District standards for system design. The most current SASD standards were adopted June 22, 2011. These standards were used in the MRSP sewer technical memorandum. These design considerations assure that the projects meet or exceed current engineering standards of OPUD. The design criteria and considerations are as follows:

1. Easements. All proposed facilities will be within a dedicated easement for future operation and maintenance, or the infrastructure will be located within existing County right-of-way. A dedicated easement is based on the following criteria:
WIDTH = Trench depth + pipe diameter + two feet, or 15 feet, whichever is greater.
Note: The above criterion refers to facilities not located in County roadways.
In most cases, if not all, the proposed facilities will be located in County roadways.

2. **2.** Sewer Flow Determination. The sewer flow demand is calculated using the estimated flow rates from various land use categories. Table 1 below, provides the estimated sewer flow rates for each proposed use.

Table No. 2.1 - Average Sewer Flow

Land Use	Flow Rate gpd	
Equivalent Single Dwelling (ESD) (gal/day) =	310	
Age Restricted Equivalent Single Dwelling (ASRESD) (gal/day) =	264	(0.85 ESD)
Multifamily Equivalent Single Dwelling (MESD) (gal/day) =	233	(0.75 ESD)
VLDR (ESD/Acre) =	4	
LDR (ESD/Acre) =	5	
MDR (ESD/Acre) =	7	
HDR (ESD/Acre) =	20	
Park (ESD/Acre) =	6	
Commercial Development (ESD/Acre) =	6	
Industrial Development (ESD/Acre) =	6	
Open Space (ESD/Acre) =	6	
Public Facilities (ESD/Acre) =	6	
Elementary /Middle School (gal/day) =	60,000	
Middle / High School (gal/day) =	80,000	
I/I Rate (gal/day//Acre) =	1,400	

*The park is based on one public bathroom with 200 persons generating 20 gal/day/person.

The Magnolia Ranch Specific Plan area is comprised of approximately 2,210 low density residential units, 540 age restricted low density units, 240 medium density residential units, 240 High density residential units, 74.5 acres of commercial/business park, 25 acres of schools, and 49.5 acres of parks. The Peak Wet Weather Flows shall be calculated by multiplying the Average Daily Dry for the upstream service area by the peaking factor.

Table No. 2.2 - Design Scenario(s)

Design Scenario	Design Flow*
MRSP Phase 1A (1,721 lots)	967,000 gpd
Employment Village Phase 1B	521,000 gpd
MRSP Phase 2A (1,262 lots)	579,000 gpd
Employment Village Phase 2B	670,000 gpd
Employment Village Phase 3A	201,000 gpd
Employment Village Phase 3B	1,311,000 gpd
Employment Village Phase 4A	174,000 gpd
Employment Village Phase 4B	223,000 gpd
Complete construction SR 65 Employment Village	4,646,000 gpd

* Does not include peaking factor or I/I.

4. Hydraulic Design Criteria. The following criteria shall be followed for all hydraulic computations and the conceptual design:

   a. The Manning's equation will be used to analyze the hydraulic grade line. The Manning's roughness coefficient "n" value to be used in the computation shall not be less than 0.013.

   b. The maximum depth of the flow at design conditions in any lateral (10-inch diameter or less) shall be 0.7 diameters. Lines 12-inch in diameter or larger may designed to flow full unless direct sewer connections are planned, in which case the 0.7 diameters maximum depth shall govern.

   c. All sanitary sewer pipes shall be designed for a minimum slope to provide a velocity of two (2) feet per second at peak flows to prevent build up.

d. Maximum design velocity shall not exceed ten (10) feet per second to prevent scour.

e. The hydraulic grade line shall be determined from the design flows, based on 100 percent development of the tributary area.

f. Table 2.3 -The minimum pipe slopes.

Pipe Diameter (in)	Minimum Design Slope (ft/ft) (Velocity = 2ft/sec)	Study Pipe Slope (ft/ft) (Undeveloped Land)	Study Velocity (ft/s)	Q_{Cap} (At Min Slope) (mgd)	Approximate of ESDs Served
Collector Sewers (Maximum flow depth = .7*pipe diameter)					
6	0.0050	0.0100	2.9	0.192	278
8	0.0035	0.0060	2.7	0.346	486
10	0.0025	0.0035	2.4	0.531	756
Trunk Sewers (Maximum flow depth = pipe diameter)					
12	0.0020	0.0024	2.2	1.029	1,122
15	0.0015	0.0018	2.2	1.616	2,166
18	0.0011	0.0014	2.2	2.251	3,232
21	0.0010	0.0012	2.3	3.237	4,784
24	0.0008	0.0011	2.4	4.134	6,359
28	0.0007	0.0010	2.6	6.405	8,883
30	0.0006	0.0010	2.6	6.491	11,895
33	0.0005	0.0010	2.8	7.640	15,405
36	0.0004	0.0010	3.0	8.619	19,764

g. System, one of the controlling conditions shall be that the lateral is to be at a sufficient depth to provide a minimum slope of 3 inch per foot, at the same time maintaining a minimum cover of 12-inches at any building location within the properties to be served. Proposed building pad elevations shall be designed to be at least six inches higher than the lowest upstream manhole rim. Additional manholes may be required even though the manhole spacing may be adequate.

5. Air-vacuum and air-relief valves. Air-vacuum and air relief valves will be used to permit release of air which accumulates in the pipeline and to prevent negative pressures from building up when the lines are drained. Valves will be located at high

points throughout the system. Air release valves will be considered on long ascending, descending, and horizontal reaches to alleviate constructing air pockets from forming in the pipeline. This is for the force main from the pump station to wastewater treatment plant.

2.4 Geometric Layout

The geometric layout of the system was based on the Magnolia Ranch Specific Plan, the General Plan zoning, the existing property lines, roads, and geographic features. All sewer mains are located within the road rights-of-way of existing or future roads.

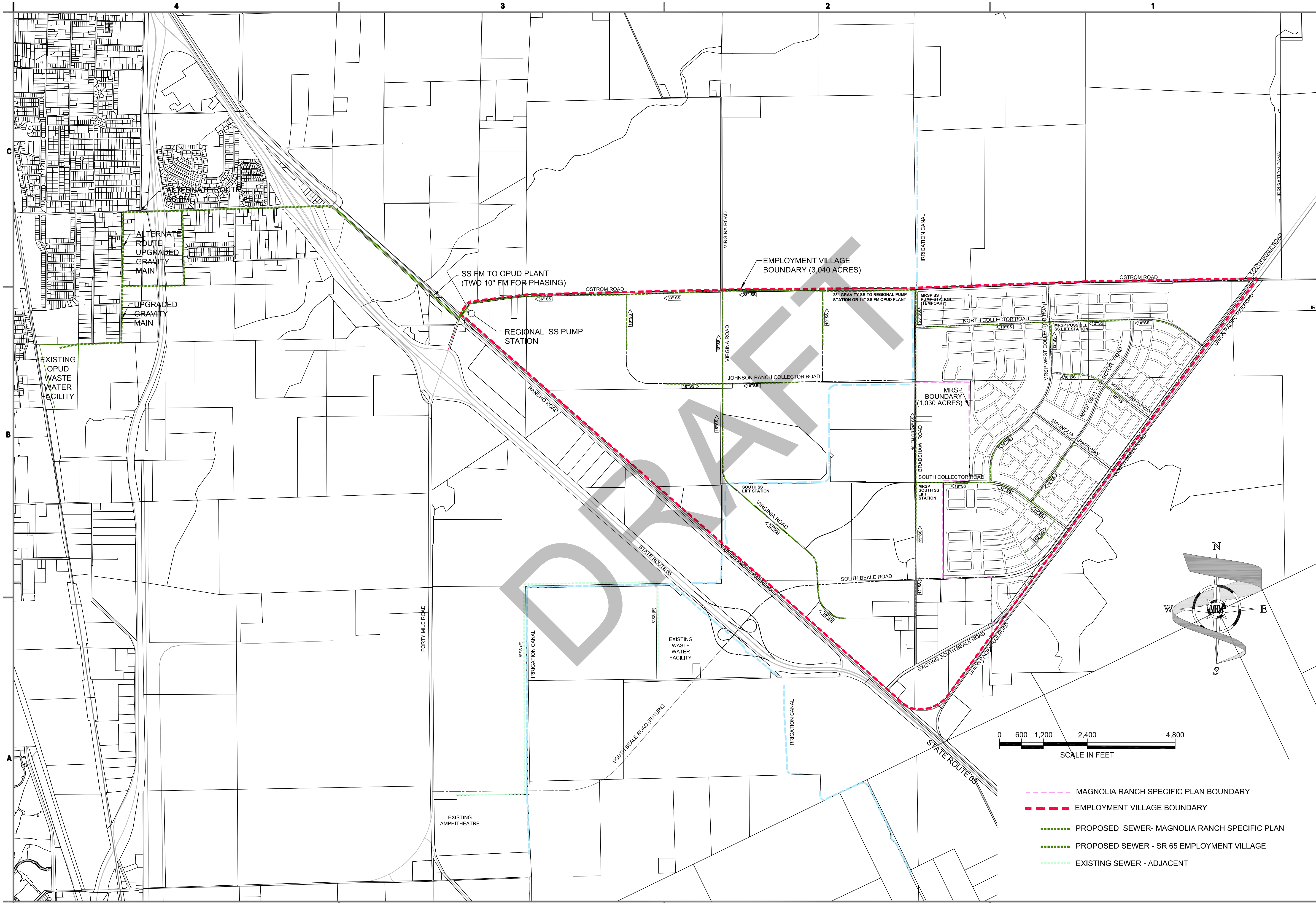
2.5 Hydraulic Analysis

The results of the hydraulic analysis are provided in Table 2.2. All of the projects, as modeled, meet the hydraulic criteria outlined in this report.

A hydraulic analysis was conducted using an EXCEL spreadsheet to analyze the proposed sanitary sewer distribution system. The EXCEL spreadsheet was developed using criteria in the Sacramento Area Sewer District Improvement Standards with the designated land uses shown in figure 1.1 and the Magnolia Ranch Specific Plan Area. The flow rates used were as stated in Table No. 2.1. The design flows were calculated by the below equations.

Peak Wet Weather Flow, PWWF (MGD) =	ADWF (PF) + I/I
Average Dry Weather Flow, ADWF (MGD) = Q =	(310 gpd/ESD) * (# ESDs) / 1,000,000
Peaking Factor, PF =	3.5-1.8Q0.05 with a minimum value of 1.2

The results of the hydraulic analysis are provided in Tables 2.4 and 2.5. All of the projects, as modeled, meet the hydraulic criteria as outlined in this report.



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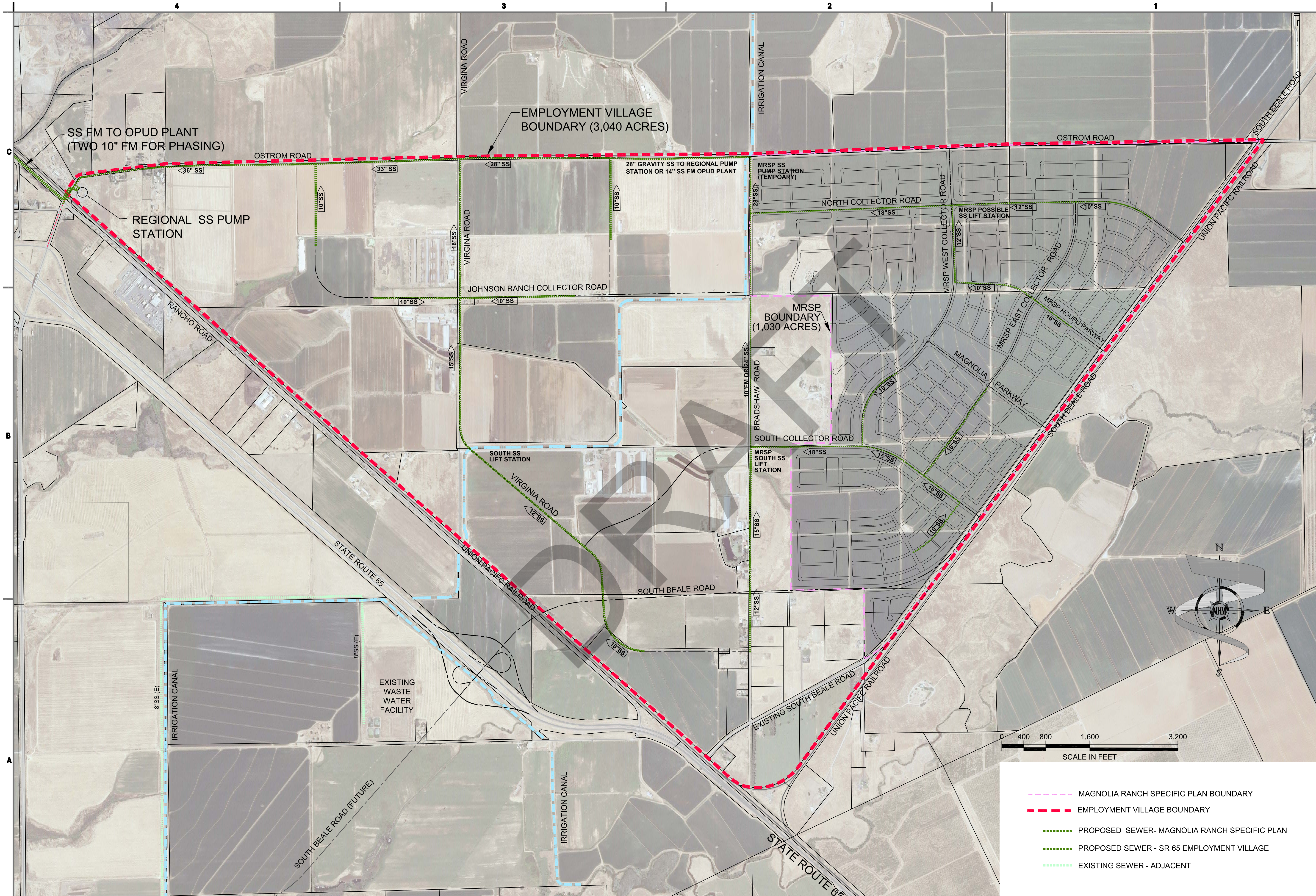
Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:
Rev. 100%

FIGURE 2-2 SANITARY SEWER MASTER PLAN

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 2-1

Dwg.:13-122



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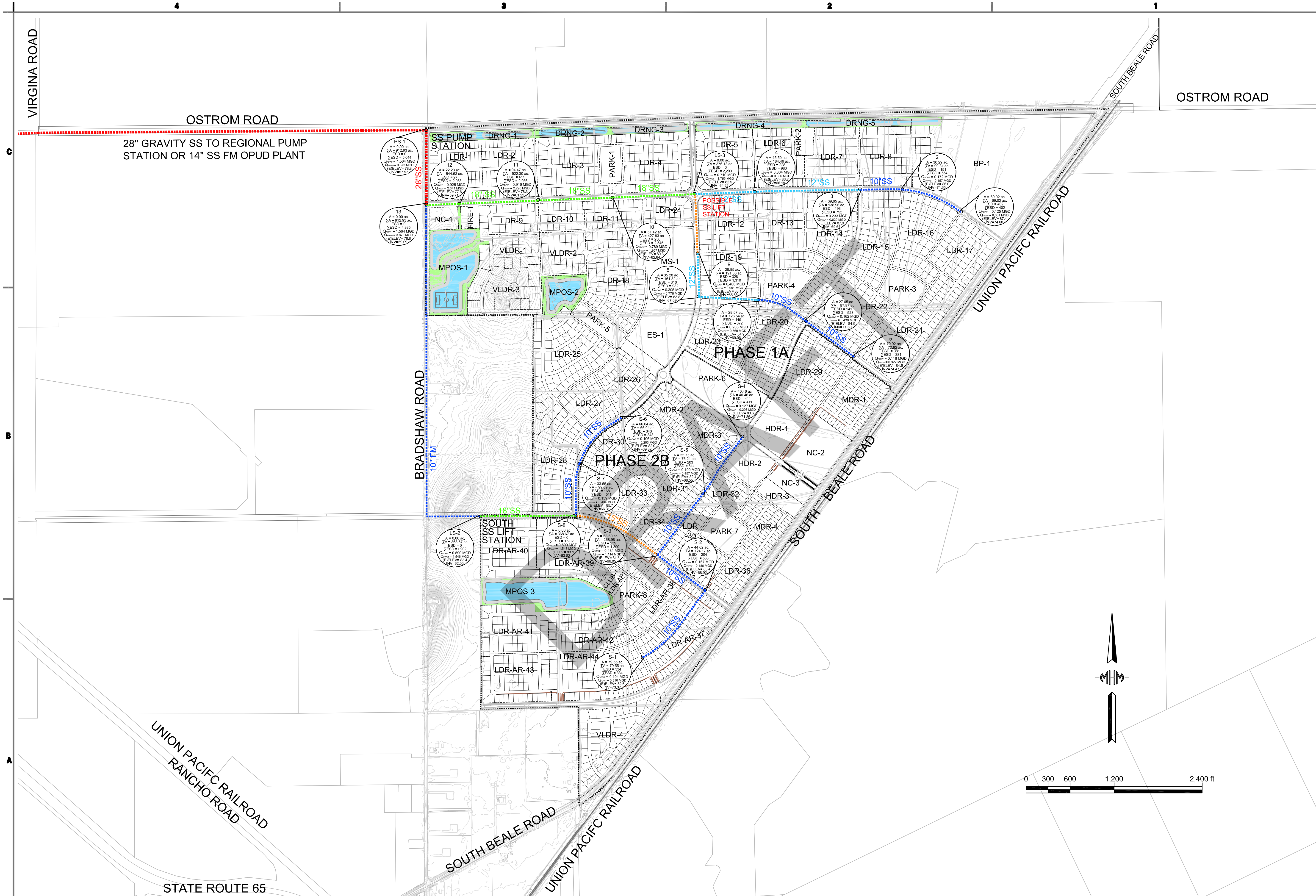
Plot scale:

FIGURE 2-2
SANITARY SEWER MASTER PLAN

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 2-2

Dwg.:13-122



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File name:
Plot date: 10-28-10
Plot scale:
Rev. 100%

FIGURE 2-3
MRSP SEWER
SCHEMATIC LAYOUT

Job Title:
CONSTRUCTION DOCUMENTS FOR:
CEM Investments
Magnolia Ranch Master Planned Community
Yuba County, California

Drawing reference number
FIGURE 2-3
Sheet of 1

Dwg.: 06-162

TABLE NO. 2.4
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
SANITARY SEWER STUDY - FLOW CALCULATIONS

Neighborhood Number	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent ESD	gpd/acre	gpd/unit	Sewer Flow (ADWF)	I/I	Peaking Factor	Sewer Flow (PWWF)
MRSP-1A	1	DRNG-1	3.25	3.25	Drainage Open-Space										0
MRSP-1A	2	DRNG-2	2.30	2.30	Drainage Open-Space										0
MRSP-1A	3	DRNG-3	2.42	2.42	Drainage Open-Space										0
MRSP-1A	4	DRNG-4	3.34	3.34	Drainage Open-Space										0
MRSP-1A	5	DRNG-5	3.32	3.32	Drainage Open-Space										0
MRSP-1A	6	LDR-1	13.04		LDR	5	5.1	67	67		310	20,770	18,253	2.02	60,146
MRSP-1A	7	LDR-2	13.62		LDR	5	5.1	69	69		310	21,390	19,069	2.01	62,166
MRSP-1A	8	LDR-3	16.67		LDR	5	4.5	75	83		310	25,840	23,339	2.00	75,037
MRSP-1A	9	LDR-4	17.67		LDR	5	4.6	81	88		310	27,382	24,732	2.00	79,397
MRSP-1A	10	PARK-1	3.85	2.99	Park				18	1,860		5,561	5,386	2.11	17,129
MRSP-1A	11	LDR-5	14.25		LDR	5	4.5	64	71		310	22,094	19,956	2.01	64,418
MRSP-1A	12	LDR-6	11.12		LDR	5	4.4	49	56		310	17,232	15,564	2.03	50,559
MRSP-1A	13	LDR-7	12.34		LDR	5	4.0	49	62		310	19,128	17,277	2.02	55,974
MRSP-1A	14	LDR-8	13.26		LDR	5	3.9	52	66		310	20,549	18,560	2.02	60,023
MRSP-1A	15	PARK-2	2.83	2.37	Park				14	1,860		4,408	3,962	2.13	13,341
MRSP-1A	16	BP-1	57.34	57.34	Bussiness Park				344	1,860		106,652	80,272	1.89	281,907
MRSP-1A	17	NC-1	2.76	2.76	Neighborhood Commercial				17	1,860		5,134	3,859	2.12	14,727
MRSP-1A	18	FIRE-1	1.75	1.75	Fire Station				11	1,860		3,255	2,451	2.15	9,443
MRSP-1A	19	MPOS-1	17.72	16.41	Drainage Open-Space										0
MRSP-1A	20	LDR-9	7.65		LDR	5	3.4	26	38		310	11,851	10,704	2.06	35,094
MRSP-1A	21	LDR-10	5.66		LDR	5	3.7	21	28		310	8,780	7,930	2.08	26,188
MRSP-1A	22	LDR-11	9.80		LDR	5	4.5	44	49		310	15,192	13,722	2.04	44,715
MRSP-1A	23	MS-1	15.93	15.00	Middle School				258			80,000	22,300	1.91	175,384
MRSP-1A	24	ES-1	12.38	12.00	Elementary School				194			60,000	17,338	1.94	133,510
MRSP-1A	25	LDR-12	13.90		LDR	5	4.5	63	70		310	21,551	19,465	2.01	62,874
MRSP-1A	26	LDR-13	17.30		LDR	5	4.5	78	86		310	26,807	24,213	2.00	77,773
MRSP-1A	27	LDR-14	14.05		LDR	5	4.4	62	70		310	21,778	19,670	2.01	63,519
MRSP-1A	28	LDR-15	14.89		LDR	5	4.0	60	74		310	23,074	20,841	2.01	67,200
MRSP-1A	29	LDR-16	15.40		LDR	5	3.4	52	77		310	23,877	21,566	2.01	69,479
MRSP-1A	30	LDR-17	11.69		LDR	5	3.6	42	58		310	18,113	16,360	2.03	53,077
MRSP-1A	31	LDR-18	20.10		LDR	5	4.3	87	101		310	31,161	28,145	1.99	90,049
MRSP-1A	32	LDR-19	11.31		LDR	5	3.7	42	57		310	17,534	15,837	2.03	51,422
MRSP-1A	33	LDR-20	18.71		LDR	5	4.7	88	94		310	28,999	26,193	1.99	83,960
MRSP-1A	34	PARK-3	6.01	4.99	Park				30	1,860		9,281	8,408	2.08	27,672
MRSP-1A	35	LDR-21	19.69		LDR	5	4.5	88	98		310	30,513	27,560	1.99	88,226
MRSP-1A	36	LDR-22	15.20		LDR	5	3.9	60	76		310	23,564	21,284	2.01	68,592
MRSP-1A	37	PARK-4	6.60	5.49	Park				33	1,860		10,211	9,244	2.07	30,369
MRSP-1A	38	LDR-23	15.93		LDR	5	4.4	70	80		310	24,698	22,308	2.00	71,806
MRSP-1A	39	LDR-24	6.03		LDR	5	5.1	31	31		310	9,610	8,439	2.07	28,361
MRSP-1A	40	VLDR-1	8.23		VLDR	4	2.7	22	33		310	10,206	11,523	2.07	32,636
MRSP-1A	41	VLDR-2	8.47		VLDR	4	3.3	28	34		310	10,507	11,863	2.07	33,578
MRSP-1A	42	VLDR-3	14.50		VLDR	4	1.7	25	58		310	17,985	20,306	2.03	56,773
MRSP-1A	43	MPOS-2	6.63	5.68	Drainage Open-Space										
MRSP-1A	44	PARK-5	7.09	5.93	Park				36	1,860		11,030	9,926	2.06	32,683
MRSP-1A	45	LDR-25	24.24		LDR	5	3.2	77	121		310	37,572	33,936	1.97	108,043
MRSP-1A	46	LDR-26	9.29		LDR	5	5.0	46	46		310	14,397	13,004	2.04	42,430
MRSP-1A	47	LDR-27	8.37		LDR	5	4.3	36	42		310	12,967	11,712	2.05	38,314
MRSP-1A	48	PARK-6	16.68	15.97	Park				96	1,860		29,704	23,354	1.99	82,472
MRSP-1A	49	LDR-28	17.17		LDR	5	3.9	67	86		310	26,606	24,032	2.00	77,205
MRSP-1A		Roads	80.00		Roads										0
MRSP Phase 1A Subtotal			**671.73**					**1,721**	**3,119**			**966,966**	**773,867**	**1.70**	**2,420,630**

TABLE NO. 2.4
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
SANITARY SEWER STUDY - FLOW CALCULATIONS

Neighborhood Number	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent ESD	gpd/acre	gpd/unit	Sewer Flow (ADWF)	I/I	Peaking Factor	Sewer Flow (PWWF)
MRSP-2A	50	LDR-29	16.55		LDR	5	5.0	82	83		310	25,650	23,168	2.00	74,500
MRSP-2A	51	MDR-1	13.48		MDR	7	6.4	86	94		310	29,246	18,869	1.99	77,110
MRSP-2A	52	MDR-2	7.34		MDR	7	6.5	48	51		310	15,932	10,279	2.04	42,724
MRSP-2A	53	MDR-3	7.25		MDR	7	6.8	49	51		310	15,722	10,143	2.04	42,177
MRSP-2A	54	HDR-1	8.25	7.61	HDR	20	20.0		124		233	28,883	11,545	1.99	69,090
MRSP-2A	55	NC-2	11.34	10.93	Neighborhood Commercial				66	1,860		20,330	15,880	2.02	56,918
MRSP-2A	56	LDR-30	12.88		LDR	5	5.0	65	64		233	15,010	18,038	2.04	48,672
MRSP-2A	57	LDR-31	14.10		LDR	5	4.5	64	71			80,000	19,747	1.91	172,831
MRSP-2A	58	HDR-2	6.26	5.72	HDR	20	20.0		94		233	21,927	8,765	2.01	52,903
MRSP-2A	59	NC-3	3.68	3.54	Neighborhood Commercial				21	1,860		6,584	5,149	2.10	18,975
MRSP-2A	60	HDR-3	3.69		HDR	20	20.0		55		233	12,928	5,167	2.05	31,692
MRSP-2A	61	MDR-4	9.06		MDR	7	6.2	56	63		310	19,650	12,678	2.02	52,393
MRSP-2A	62	LDR-32	6.55		LDR	5	4.6	30	33		310	10,158	9,175	2.07	30,192
MRSP-2A	63	PARK-7	6.03	5.99	Park				36	1,860		11,141	8,447	2.06	31,425
MRSP-2A	64	LDR-33	16.49		LDR	5	4.4	72	82		310	25,557	23,084	2.00	74,238
MRSP-2A	65	LDR-34	7.48		LDR	5	5.4	40	40		310	12,400	10,465	2.05	35,944
MRSP-2A	66	LDR-35	10.48		LDR	5	4.8	50	52		310	16,243	14,671	2.04	47,728
MRSP-2A	67	LDR-36	6.85		LDR	5	5.1	35	35		310	10,850	9,592	2.06	31,991
MRSP-2A	68	LDR-AR-37	19.08		LDR-AR	5	5.0	95	81		310	25,184	26,710	2.00	77,144
MRSP-2A	69	LDR-AR-38	8.82		LDR-AR	5	4.3	38	38		310	11,648	12,354	2.06	36,339
MRSP-2A	70	LDR-AR-39	23.72		LDR-AR	5	3.8	90	101		310	31,317	33,215	1.99	95,417
MRSP-2A	71	LDR-AR-40	14.06		LDR-AR	5	3.4	48	60		310	18,554	19,679	2.03	57,258
MRSP-2A	72	MPOS-3	15.86	15.86	Drainage Open-Space										
MRSP-2A	73	PARK-8	4.62	3.96	Park				24	1,860		7,366	6,472	2.09	21,880
MRSP-2A	74	CLUB-1	2.24	1.96	Clubhouse				12	1,860		3,646	3,143	2.14	10,946
MRSP-2A	75	LDR-AR-41	13.72		LDR-AR	5	4.5	62	58		310	18,116	19,214	2.03	55,938
MRSP-2A	76	LDR-AR-42	13.25		LDR-AR	5	4.2	56	56		310	17,495	18,555	2.03	54,063
MRSP-2A	77	LDR-AR-43	14.29		LDR-AR	5	4.5	64	61		310	18,862	20,006	2.02	58,185
MRSP-2A	78	LDR-AR-44	20.19		LDR-AR	5	4.2	84	86		310	26,655	28,270	2.00	81,537
MRSP-2A	79	VLDR-4	18.09		VLDR	4	2.7	48	72		310	22,428	25,322	2.01	70,432
MRSP-2A		Roads	20.00		Roads										0
MRSP Phase 2A Subtotal			**355.72**					**1,262**	**1,766**			**579,484**	**447,801**	**1.75**	**1,460,994**
MRSP Project Total			**1,027.45**					**2,983**	**4,885**			**1,546,450**	**1,221,667**	**1.66**	**3,789,289**

Area	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent ESD	gpd/acre	gpd/unit	Sewer Flow (ADWF)	I/I	Peaking Factor	Sewer Flow (PWWF)
EV-3A	1	LDR-1	90.00		LDR	5		450	450		310	139,500	126,000	1.87	386,701
EV -3A	2	LDR-2	10.00		LDR	5		50	50		310	15,500	14,000	2.04	45,597
EV -3A	3	LDR-3	30.00		LDR	5		150	150		310	46,500	42,000	1.96	132,954
EV -4A	4	VLDR-1	80.00		VLDR	4		320	320		310	99,200	112,000	1.90	300,122
EV -4A	5	VLDR-2	60.00		VLDR	4		240	240		310	74,400	84,000	1.92	226,795
EV -1B	6	IN-IND-1	130.00		IND	6			780		310	241,800	182,000	1.82	622,883
EV -3B	7	IN-IND-2	130.00		IND	6			780		310	241,800	182,000	1.82	622,883
EV -3B	8	IN-IND-3	85.00		IND	6			510		310	158,100	119,000	1.86	412,842
EV -4B	9	HC-1	50.00		COM	6			300		310	93,000	70,000	1.90	246,845
EV -4B	10	HC-2	70.00		COM	6			420		310	130,200	98,000	1.87	342,052
EV -3B	11	BP-1	30.00		BP	6			180		310	55,800	42,000	1.94	150,356
EV -3B	12	BP-2	80.00		BP	6			480		310	148,800	112,000	1.86	389,296
EV -3B	13	BP-3	80.00		BP	6			480		310	148,800	112,000	1.86	389,296
EV -2B	14	OUT-IND-1	100.00		IND	6			600		310	186,000	140,000	1.85	483,205
EV -2B	15	OUT-IND-2	65.00		IND	6			390		310	120,900	91,000	1.88	318,347
EV -1B	16	OUT-IND-3	150.00		IND	6			900		310	279,000	210,000	1.81	715,352
EV -3B	17	OUT-IND-4	130.00		IND	6			780		310	241,800	182,000	1.82	622,883
EV -3B	18	OUT-IND-5	170.00		IND	6			1,020		310	316,200	238,000	1.80	807,381
EV -1B	19	OUT-IND-6	30.00		IND	6			180		310	55,800	42,000	1.94	150,356
EV -1B	20	OUT-IND-7	135.00		IND	6			810		310	251,100	189,000	1.82	646,045
EV -1B	21	RR-1	45.00		VLDR	4		180	180		310	55,800	63,000	1.94	171,356
EV	22	OS	110.00		Drainage Open-Space										0
EV	23	OS	150.00		Roads										0
Employment Village (outside MRSP) Subtotal			**2,010.00**					**1,390**	**10,000**			**3,100,000**	**2,450,000**	**1.60**	**7,395,240**
Employment Village Total			**3,037.45**					**4,373**	**14,885**			**4,646,450**	**3,671,667**	**1.56**	**10,902,951**

TABLE NO. 2.5
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
SANITARY SEWER STUDY
NODE FLOW CALCULATIONS

Node	Next Node	Areas in at Node	Phase	A Area In (Acres)	ΣA Total Area In (Acres)	ESD Design ESD In	ΣESD Total ESD In	Q_{ave} Sewer Flow (ADWF) (mgd)	I/I (mgd)	Peaking Factor	Q_{PWWF} Sewer Flow (PWWF) (mgd)	Study Pipe Slope (ft/ft)	Min. Pipe Slope (ft/ft)	Pipe Diameter (in)	Study Velocity (ft/s)	Length (ft)	Study Pipe Invert (1929)	Min. Pipe Invert (1929)	OG Elev. (1929)	Est Depth (ft)	Q_{Cap} (At Min Slope) (mgd)	Remaining Capacity (mgd)
Ostrom Road (MRSP Offsite Connection to Regional System)																						
BRAD	COL A		EV	65.00	1557.24	390	8,525	2.643	2.180	1.61	6.436	0.0010	0.0007	28	2.5	2,550	56.40	45.79	64.0	6.60	6.972	0.536
COL A	VIRG		EV	75.00	1632.24	450	8,975	2.782	2.285	1.61	6.752	0.0010	0.0007	28	2.5	2,730	53.85	53.03	73.0	18.15	6.972	0.220
VIRG	JR COL		EV	820.00	2452.24	4,920	13,895	4.307	3.433	1.56	10.168	0.0010	0.0005	33	2.8	2,620	51.12	49.81	64.0	11.88	10.805	0.637
JR COL	RG LS		EV	180.00	2632	990	14,885	4.614	3.685	1.56	10.870	0.0010	0.0004	36	3.0	4,500	48.50	45.80	69.0	19.50	13.627	2.758
																Regional LS Invert =	**44.00**		**64.0**	**19.00**		
Virginia Road																						
COM	SB		EV	60.00	60.00	360	360	0.112	0.084	1.89	0.295	0.0035	0.0025	10	2.4	1,350	61.35	54.50	73.0	10.66	0.837	0.543
SB	S COL		EV	30.00	90.00	180	540	0.167	0.126	1.85	0.436	0.0035	0.0025	10	2.4	1,100	56.62	55.52	74.0	16.38	0.837	0.401
S COL	EV LS		EV	160.00	250.00	960	1,500	0.465	0.350	1.77	1.172	0.0018	0.0015	15	2.2	2,650	52.77	51.98	73.0	19.23	1.771	0.599
																EV LS Invert =	**48.00**		**72.0**	**23.00**		
EV LS	JR COL		EV	300.00	550.00	1,800	3,300	1.023	0.770	1.70	2.507	0.0014	0.0011	18	2.2	2,880	55.15	54.29	72.0	15.85	2.539	0.032
JR COL	OSTR		EV	155.00	705	930	4,230	1.311	0.987	1.68	3.184	0.0012	0.0010	21	2.3	2,530	54.16	53.65	69.0	13.84	3.546	0.362
																Ostrom Road Invert=	**51.12**		**64.0**	**11.88**		
MRSP Main System																						
1	2	16,30	1	69.02	69.02	402	402	0.125	0.097	1.88	0.331	0.0035	0.0025	10	2.4	865	73.01	68.50	87.4	13.39	0.531	0.200
2	3	28, 29	1	30.29	99.31	151	554	0.172	0.139	1.85	0.457	0.0035	0.0025	10	2.4	575	69.98	68.50	86.0	15.02	0.531	0.074
3	4	13, 14, 27	1	39.65	138.96	198	752	0.233	0.195	1.83	0.620	0.0024	0.0020	12	2.2	1,440	67.97	67.07	84.9	15.93	0.772	0.152
4	LS-3	11, 12, 15, 26	1	45.50	184.46	228	980	0.304	0.258	1.80	0.806	0.0024	0.0020	12	2.2	820	64.51	64.19	86.2	20.69	1.128	0.322
5	6	34, 35, 36, 50, 51	1 &2	70.92	70.92	381	381	0.118	0.099	1.88	0.322	0.0035	0.0025	10	2.4	820	72.80	70.44	84.9	11.10	0.531	0.209
6	7	33, (1/2)48	1 &2	27.05	97.97	141	523	0.162	0.137	1.86	0.438	0.0035	0.0025	10	2.4	725	69.93	68.39	84.9	13.97	0.708	0.270
7	8	(1/2) 32, 37, (1/2) 38, (1/2)48	1	28.57	126.54	149	672	0.208	0.177	1.84	0.560	0.0024	0.0020	12	2.2	820	67.39	66.58	84.9	16.51	1.029	0.470
8	9	24, (1/2)32, (1/2)38, 39, (1/2)44	1	35.58	162.12	310	982	0.305	0.227	1.80	0.776	0.0024	0.0020	12	2.2	590	65.42	64.94	83.8	17.38	1.029	0.253
9	LS-3	23, 25	1	29.83	191.95	328	1,310	0.406	0.269	1.78	0.991	0.0018	0.0015	15	2.2	810	64.00	63.76	83.1	18.10	1.616	0.625
																LS-3 or Pipe Invert =	**62.55**		**82.7**	**19.15**		
LS-3	10		1		376.41		2,290	0.710	0.527	1.73	1.755	0.0014	0.0011	18	2.2	1,125	62.55	61.45	82.5	18.95	2.539	0.784
10	11	9, 10, 22, 31	1	51.42	427.83	256	2,545	0.789	0.599	1.72	1.957	0.0014	0.0011	18	2.2	1,015	60.97	60.21	80.3	18.33	2.539	0.582
11	12	6, 7, 8, 20, 21, 40, 41, 42, 43	1	94.47	522.30	411	2,956	0.916	0.731	1.71	2.296	0.0014	0.0011	18	2.2	1,080	59.55	59.09	78.3	17.75	2.539	0.243
12	13	17, 18, 19	1	22.23	544.53	27	2,983	0.925	0.762	1.71	2.341	0.0014	0.0011	18	2.2	445	58.04	57.90	77.6	18.56	2.539	0.198
13	PS-1		1	32.50	1492.24	195	8,135	2.522	2.089	1.61	6.161	0.0010	0.0007	28	2.5	1,015	57.42	57.11	78.8	20.39	6.972	0.811
																LS-1 or Pipe Invert =	**56.40**		**78.8**	**21.40**		
MRSP South System																						
S-1	S-2	75, 76, 77, 78, 79	2	81.46	81.46	334	334	0.104	0.114	1.89	0.310	0.0035	0.0025	10	2.4	1,270	73.37	70.52	82.6	8.23	0.531	0.221
S-2	S-3	(1/2) 66, 67, 68, 69, 73	2	44.62	126.08	204	538	0.167	0.177	1.85	0.486	0.0035	0.0025	10	2.4	820	68.92	67.34	83.4	13.48	0.531	0.045
S-4	S-5	53, 54, 55, 58, 59, 60	2	40.46	40.46	411	411	0.127	0.057	1.88	0.296	0.0035	0.0025	10	2.4	945	71.86	69.73	83.6	10.74	0.531	0.235
S-5	S-3	57, 61, 62, 63	2	35.75	76.21	203	614	0.190	0.107	1.84	0.457	0.0024	0.0020	12	2.2	1,040	68.55	67.37	82.4	12.85	0.772	0.315
S-3	S-8	65, (1/2) 66, 70, 71, 72, 74	2	68.60	270.89	239	1,390	0.431	0.379	1.77	1.144	0.0018	0.0015	15	2.2	1,240	66.05	65.29	81.5	14.45	1.616	0.472
S-6	S-7	(1/2) 44, 45, 46, 47, 52, 56	1 &2	65.67	65.67	343	343	0.106	0.092	1.89	0.293	0.0035	0.0025	10	2.4	875	69.37	67.39	82.0	11.63	0.531	0.238
S-7	S-8	49, 64	1 &2	33.65	99.32	168	511	0.159	0.139	1.86	0.434	0.0035	0.0025	10	2.4	710	66.31	65.21	85.7	18.40	0.531	0.097
S-8	LS-2		2		370.21		1,902	0.590	0.518	1.75	1.548	0.0014	0.0011	18	2.2	1,300	63.82	63.43	83.1	18.28	2.251	0.703
Bradshaw Road																						
VIRG	SB		EV	200.00	200.00	920	920	0.285	0.280	1.81	0.796	0.0024	0.0020	12	2.2	1,100	69.41	68.97	78.0	7.59	1.029	0.233
SB	LS-2		EV	125.00	325.00	710.00	1630	0.505	0.455	1.76	1.345	0.0018	0.0015	15	2.2	2,650	66.77	65.98	77.0	9.23	1.616	0.272
																LS-2 Invert =	**62.00**		**83.4**	**20.40**		
LS-2	JR COL		EV	220.00	915.21	1,230	4762	1.476	1.281	1.66	3.738	0.0011	0.0008	24	2.4	2,800	61.06	60.22	78.6	16.54	4.848	1.109
JR COL	13		EV	32.50	947.71	195	4957	1.537	1.327	1.66	3.879	0.0011	0.0008	24	2.4	1,440	57.98	57.55	79.6	20.62	4.848	0.969

2.6 Pipe Selection

The type of pipe used for the closed conduit will meet the requirements of OPUD. We have provided five different pipe alternatives, which we feel will meet the requirements of the design. The pipes are as follow:

1. High Density Polyethylene (HDPE) Pipe for force main. The pipe shall be 100 psi (DR17) minimum and conform to the requirements of AWWA C906. All joints and fittings shall be by the butt fusion method. All fittings shall conform to AWWA C906 requirements.

2. Vitrified Clay Pipe (VCP) for gravity. The pipe and fittings shall be extra strength unglazed, bell and spigot pipe and shall conform to ASTM designation C-700. The pipe joints shall be of the mechanical compression type, conforming to ASTM designation C-425.

3. Ductile-Iron Pipe (DIP) for gravity or force main. The pipe shall be Class 51 for non-pressure pipe and thickness class 53 for pressure pipe minimum and conform to the requirements of AWWA C151 for ductile-iron pipe. The fittings shall conform to AWWA C110 for cost iron fittings and C111 for rubber gasket joints. All flanged fittings shall conform to AWWA C110. All ductile iron pipes shall have fusion bonded epoxy coating. Fusion bonded epoxy coatings shall be Scotchkote No. 206-N or equal, 12 mils minimum thickness, applied according to manufacturer's recommendations.

4. Polyvinyl Chloride (SDR 35) Pipe for gravity. The pipe shall be polyvinyl chloride pipe conforming to ASTM D3034 (PVC). The polyvinyl chloride pipe joints shall have rubber rings conforming to ASTM F477 and have joints meeting or exceeding the requirements of ASTM D3139.

5. Polyvinyl (PVC) (C-900 or C-905) Pipe for force main. The pipe shall conform to current AWWA C-900 or AWWA C-905 and have underwriters' Laboratories, Factory Mutual and NSF approval. All parts of C-900 or C-905 not in conflict with these specifications shall apply in force. The pipe shall be 150 psi (SDR18) PVC 1120 ASTM D1784 (12454-B), polyvinyl chloride pipe conforming to AWWA C-900

(PVC) or AWWA C-905 (PVC), be 165 psi (SDR25) PVC 1120. The polyvinyl chloride pipe joints shall be rubber rings conforming to ASTM F477 and have joints meeting or exceeding the requirements of ASTM D3139.

6. Concrete Cylinder Pipe (CCP) for gravity or force main. The pipe shall be rated for the pressure and depth of the installation. Rubber gasketed joints for gravity installation and welded, coated joints for force mains. All pipes shall have fusion bonded epoxy lining. Fusion bonded epoxy coatings shall be Scotchkote No. 206-N or equal, 12 mils minimum thickness, applied according to manufacturer's recommendations.

2.7 Pump Stations

The sanitary sewer lift station shall be designed in accordance with OPUD standards. The criteria are as follows:

1. Location: The minimum distance from the pump station to any existing or future home or other structure shall be 50 feet. Adequate access must be furnished for vehicles of adequate size to deliver chlorine cylinders or to remove station equipment.

2. Capacity: Depending on the size of the service area and the extent of the development at the time of the station construction, the station's initial pumping capacity may be less than ultimate. Allowance for larger or additional pumping equipment shall be made for future development.

3. Wet Well: The shape of the wet well and the detention time will be such that the deposition of solids is minimized and the sewage does not become septic.

4. Pumps: Only centrifugal pumps will be used. Pump suction and discharge size shall be a minimum of six inch diameter. Pump drive units shall be electric. A sufficient number of pumping units shall be installed such that station capacity can be maintained with any one unit out of service.

5. Force Mains: Force mains shall be designed such that velocities normally fall within a range from 3 to 8 feet per second.

6. SCADA System: All sewer lift station motor control centers shall have a fully functional SCADA system capable with the OPUD requirements.

7. Backup Generators: All sewer lift stations will be designed with a receptacle for a portable backup generator capable of running the primary pumps. The regional sewer lift station shall have a backup generator directly connected to motor control center. For instance on a duplex system one pump is a redundant pump therefore the receptacle shall be capable of handling a generator that can operate one of the pumps.

2.8 Summary and Recommendation

The primary goal of this study is to analyze the proposed schematic design for construction of the sanitary sewer system and to prepare an interim downstream system. The sanitary sewer improvements will be constructed in phases and financed by the developers as part of the projects within the Employment Village. No certificates of occupancy shall be granted until all required improvements are constructed and are operational. The developer will enter into a reimbursement agreement with the OPUD to collect sewer extension fees and temporary improvements used by other development projects.

Results of the sewer analysis and the proposed system layout are included within this report. The minimum pipe sized and analyzed was ten inches for the backbone of the system. Smaller pipe sizes of eight inches could be used to convey sewer to the backbone system. The entire project area will be served by the regional pump station located at Ostrom Road just east Rancho Road. This allows the entire Village area to be served by one pump station connection to the OPUD waste water treatment facility. As stated before, the 15 foot depth is the desired maximum depth of the trunk line for service laterals from the user to be directly connected to the trunk line. However, to meet OPUD’s desire for gravity flow instead of multiple lift stations, some of the trunk line depths were increased. Whenever possible the design will be less than 15 feet in order to minimize placing the trunk lines below ground water.

The phasing of the offsite improvements identified in the figures above is as follows:

<u>Magnolia Ranch Specific Plan Phase 1</u> – The MRSP currently is leading development in the Employment Village that will begin the sewer infrastructure development. The first

phase of the MRSP will have to install all the gravity collection mains to serve the phase 1 area. There are currently two lift stations shown in the MRSP as likely to be a part of phase 1. The first would service the east half of the north area if the gravity main is unable to maintain depth. The second lift station would be installed on the South Collector Road and be used to pump the south half of MRSP down Bradshaw Road until the gravity line is installed with future Employment Village development. If the regional lift station and gravity line in Ostrom Road is not installed with or prior to MRSP phase 1, a pumping station will be installed near the corner of Bradshaw Road and Ostrom Road. The pump station will pump the MRSP sewer flows to the OPUD waste water facility until the regional pump station and gravity line are constructed.

<u>Magnolia Ranch Specific Plan build out</u> – The sewer facilities constructed with the MRSP phase 1 should support the build out of the MRSP with only required extensions of the designed collection mains. Some of the pumps installed with the first need to be increased in sized based on the phase 1 design.

<u>Regional Detention Pump Station</u> – The Employment Village area would be best served by a single pump station that pumps the entire flow from the Village area to the OPUD waste water facility because of the long distance to that facility. The ideal location for this facility would be in the northwest corner of the Village area near the intersection of Ostrom Road and Rancho Road. This is the closest to the route to the OPUD plant, a lower area within the Village and Ostrom Road is an ideal alignment for the main sewer collection piping. The down side of this facility is that it may need to be phased in construction to reduce cost and have it operate properly until enough of the service area has developed. The cost of the regional station may be too great to construct for a small portion of the Employment Village area and may need to be delayed until enough development has occurred with the Village

<u>Ostrom Road Collection Main</u> – The layout of the roads and topography of the Employment Village make Ostrom Road the best location for the backbone sewer line that would collect all the lines from the Employment Village area and route the flows to a regional pump station. This line would extend from the regional pump station to Bradshaw Road. Depending on the phasing of the regional pump station and how the Employment Village develops this main may not be constructed until later in the development phase of the Employment Village.

Bradshaw Road – The Employment Village sewer facilitates along Bradshaw Road would tie into and upgrade the facilities constructed with MRSP. This would allow the corridor to develop soon after the MRSP phase sewer improvements are constructed without much additional infrastructure required.

Virginia Road – The center of the Employment Village would be serviced by the sewer facilities constructed in Virginia Road. These facilities would tie into the Ostrom Road collection main and the regional pump station. For this reason the development along this corridor would be tied to the construction of the regional pump station and the collection main in Ostrom Road. The main in Virginia Road will need a lift station to be able to serve to the south end of the Employment Village. The lift station is proposed to be located on Virginia Road where it crosses the Yuba County Water Irrigation main canal. This is a general location that can be adjusted during the development of that area of the Employment Village

3 - Water Supply and Distribution Infrastructure

3.1 Summary of the Water Supply Assessment Study

California law (SB 610) requires the preparation of a Water Supply Assessment for large development projects, such as is proposed for State Route 65 Employment Village. The intent of the assessment is to assure that adequate water resources are available to the community in the future. The Employment Village area is within the Sphere of Influence Boundary for OPUD shown in the 2010 Urban Water Management Plan adopted in December 2011. The OPUD 2010 UWMP also specifically identifies the MRSP area. The MRSP had Atkins prepare a Water Supply Assessment that covers the MRSP area and a draft copy of that report is attached in appendix E. The WSA found that over the next 15 years the OPUD through the new infrastructure improvements has sufficient water supplies to support the MRSP during normal water years.

There are three primary areas addressed in the water supply assessment: (1) all relevant water supply entitlements, including water rights and water contracts; (2) a description of the available water supplies; and (3) an analysis of the demand placed on those supplies, by the project, and all existing and planned future uses in the area.

3.2 Water System Design

A new network of ground water wells and storage tanks is the water source that will serve the Magnolia Specific Plan and the entire State Route 65 Employment Village.

The water distribution system will consist of a looped system as shown below in Figure 3-1, on the following page. The main loop of the Employment Village water system will be in Virginia Road, Ostrom Road and South Beale Road. For the MRSP, the major connection between the wells within the looped system has been identified in the North Collector Road and the East Collector Road. The MRSP has identified the location of the storage tanks near the intersection of the North Collector Road and Bradshaw Road. This storage should be able to serve the MRSP area. Additional storage will needed for the Employment Village water system, but the ideal location of this storage may be dictated by the phasing of the development so it has not been identified at this time.

All of the improvements will be constructed in accordance with OPUD standards. The improvements will be constructed and financed by the developers as part of the project improvements. The water lines will be constructed as part of the phased roadway improvements. For instance, the North Collector Road line, Magnolia Parkway, Houpu Parkway, and the first portions of the East, West, and South Collector Roads will be constructed as part of the first phase of the MRSP development. No certificates of occupancy shall be granted until all necessary phases of the improvements have been constructed and are operational.

3.3 Goals of the Analysis

This pre-design analysis has been prepared for use as an aid in determining new water infrastructure improvements. The intent of this analysis is to review and assess existing information and to determine possible infrastructure improvements. The goals of the analysis are as follows:

- Determine the geometric and hydraulic design parameters
- Prepare design calculations and schematic design
- Prepare Conceptual Design

3.4 Design Criteria

The design of a domestic water system depends on many factors, some of which can be measured with a fair degree of precision and others which rely upon engineering judgment. This section of the report discusses the parameters required to design a domestic water system acceptable to OPUD for the State Route 65 Employment Village.
A domestic water system has six major elements as follows:

1. A source or sources of supply. OPUD's current system is a series of ground water wells located throughout the District. For the State Route 65 Employment Village all new ground water wells would be developed within the Employment Village area. Based on the proximity to other OPUD existing facilities these new well would not initially be interconnected with the existing OPUD system and would serve the Employment Village area independently.

2. A means of testing the purity of the water and treating it is necessary to assure its potability.

3. Water mains to interconnect the sources of supply and the storage tanks, and to connect them with the local distribution systems enabling the local distribution networks to draw from alternative sources when necessary.

4. Local lines to distribute the water to individual customers, and meters to measure water usage. These lines must be sufficiently large to also provide fire flows. It is important that these local lines provide "loop" circulation for continuous flow.

5. A system of hydrants to be used by the Fire Department.

6. A management, operating, and maintenance group.

The emphasis of this pre-design analysis is element number 3. Elements 4 and 5 will be provided internally as part of the development and the remaining elements will be provided by OPUD.

3.5 General Design Considerations

Numerous design considerations were made to properly produce a conceptual design. These design considerations will assure that the project meets current OPUD engineering standards. The design criteria and considerations are as follows:

1. Easements: All proposed facilities will have a dedicated easement provided for future operation and maintenance, or the infrastructure will be located within existing City right-of-way. The dedicated easement will be based on the following criteria:
   WIDTH = Trench depth + pipe diameter + two feet, or 15 feet, whichever is greater.
   In most cases, the proposed facilities will be located under City roadways. The criterion above refers to lines not located in City roadways.

2. Water Demand. The water demand requirements will be a combination of demand rate for each land use type plus the corresponding fire flows. Table No. 3.1 reveals the

domestic water demand rates and fire flow conditions for each use proposed. The projected population was based on:

- The average density (dwelling units per acre for each residential land use classification).
- Land Use Types shown in the Figure B and the MRSP.
- Average household size of 2.67 people per dwelling unit.
- Age Restricted average household size of 1.80 people per dwelling unit.

Table No. 3.1 – Maximum Day Water Demand Rates

Land Use Category		Average Day Unit Water Demand (gpd)	Maximum Day Unit Water Demand (gpd)	Maximum Day Unit Water Demand (gpm)	Peak hour Day Unit Water Demand (gpm)
Residential (per DU)	VLDR (<3.5 DU's/Ac)	728	1456	1.0	1.7
	LDR (3.5 to 5.0 DU's/Ac)	600	1200	0.8	1.4
	LDR AR (3.5 to 5.0 DU's/Ac)	521	1042	0.7	1.2
	MDR (>6.0 to 8.0 DU's/Ac)	430	860	0.6	1.0
	MDR (>8.0 to 12.0 DU's/Ac)	323	646	0.4	0.8
	HDR (>12.0 to 16.0 DU's/Ac	288	576	0.4	0.7
	HDR (>16.0 DU's/Ac)	177	354	0.2	0.4
Commercial/Other (per acre)	Commercial/Retail	2598	5196	3.6	6.1
	Business Professional	2598	5196	3.6	6.1
	Light Industrial	2598	5196	3.6	6.1
	Industrial	2562	5124	3.6	6.0
	Storage Yard	109	218	0.2	0.3
	Elementary Schools	3454	6908	4.8	8.2
	High Schools	4060	8120	5.6	9.6
	Public (Fire Station, etc.)	1780	3560	2.5	4.2
	Park/Recreation	2988	5976	4.2	7.1
	Open Space/Major ROW				
	Vacant/Unassigned				

Table No. 3.2 – Insurance Office Fire-Flow Demand and Storage Requirements

Land Use Category	Minimum Flow at 20 psi (gpm)	Storage Volume (Gal)
Residential – Low Density	2,000	480,000
Residential – Medium Density	3,000	720,000
Commercial	5,000*	1,200,000
Industrial	5,000*	1,200,000
Schools, Hospitals, Civic	4,000*	980,000

* Maximum flows, may be reduced based on automatic sprinkler systems.

The above fire flow requirements are the same as those in other similar county areas.

For master planning, fire flow requirements are often based on guidelines developed by the National Insurance Underwriters Association (e.g., Insurance Services Office {ISO}) for insurance rating purposes. The ISO fire insurance are a function of the type of structures (including building type, building material, separation) and whether the buildings are equipped with sprinkling systems. The typical ISO requirements are 1,500 gpm for single family residential; 2,500 gpm for multiple family residential; 2,500 to 3,500 gpm for business and small commercial; and 3,500 to 5,000 gpm for industrial and large commercial centers.

The Insurance Services Office (ISO) grades areas for fire insurance purposes. The ISO grading results can affect the fire insurance costs of residents. The ISO grading considers both water system and fire department considerations. Grading is summarized as a “Protection Class.” Class 1 is the best possible protection and Class 10 is the worst.

The water system (treatment and distribution) accounts for 35 percent of the total possible grading points. An additional 5 percent of the total possible protection points are related to fire hydrant type, spacing, maintenance and inspection. Fire department considerations (firefighting manpower including fire stations, equipment, and staff) account for 60 percent of the total possible points.

Table No. 3.3 – System Design Requirements(s)

Design Scenario (Including Fire Flows)	Cumulative System Design Flow (Max Day plus Fire)
MRSP Phase 1A (1,721 lots)	5,500 gpm
Employment Village Phase 1B	6,000 gpm
MRSP Phase 2A (1,262 lots)	7,500 gpm
Employment Village Phase 2B	8,500 gpm
Employment Village Phase 3A	9,000 gpm
Employment Village Phase 3B	10,000 gpm
Employment Village Phase 4A	10,500 gpm
Employment Village Phase 4B	11,000 gpm
Complete construction SR 65 Employment Village	11,000 gpm

3. Storage: Water storage will be necessary to meet fire flow and peak hour demand requirements. Water storage will equalize supply and demand in the long term and will furnish water during emergencies, such as fires and loss of water supply. The required storage capacity depends upon the flow variation expected in the system. In order to equalize the rate, when use is less than average, the excess must be stored for use when the usage rate is higher than average. Additional storage beyond this requirement is required to provide fire protection.

4. Hydraulic Design Criteria: The following criteria shall be followed for all hydraulic computations and the conceptual design:
   a. The Hazen Williams equation will be used to analyze the hydraulic grade line. The Hazen Williams value to be used in the computation will be 150.
   b. Velocities at maximum flow, including fire flow, will be limited to eight feet per second.
   c. The minimum pressure at the point of delivery will be a normal static pressure of 60 to 75 lb/in^2. The distribution line within the State Route 65 Employment Village will be capable of a minimum 50 psi, with 20 psi residual with fire flow.

5. Air-Vacuum and Air-Relief Valves: Air-vacuum and air relief valves will be used to permit the release of air which accumulates in the pipeline and to prevent negative pressures from building up when the lines are drained. Valves will be located at high points throughout the system. Air release valves will be considered on long ascending, descending, and horizontal reaches to alleviate air pockets from forming in the pipeline.

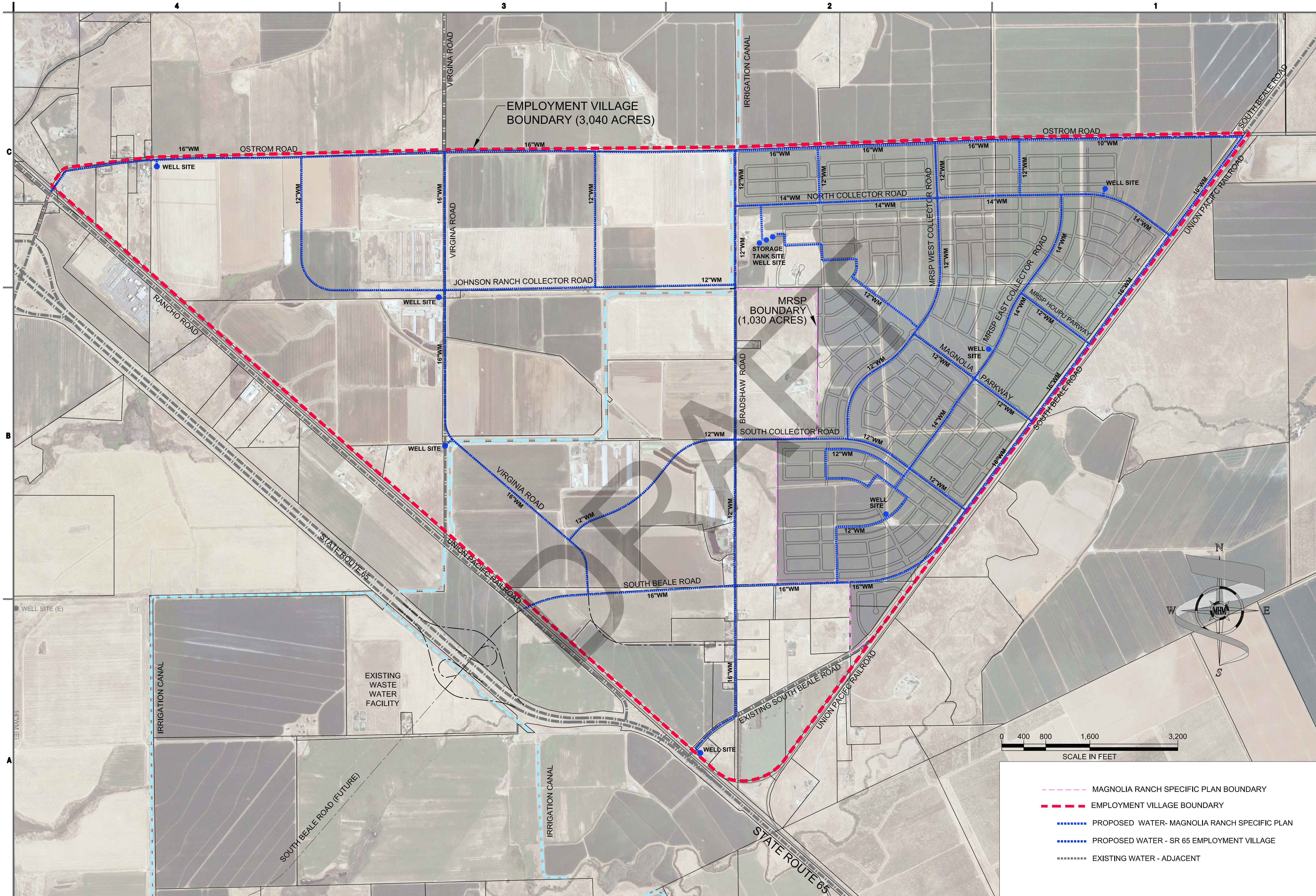
6. Pressure Reducing/Regulating Valves: Pressure reducing/regulating valves will be provided to automatically reduce the pressure on the downstream side to any desired level. They function by using the upstream pressure to throttle the flow through an opening similar to that in a globe valve. The throttling valve will close (or open) until the downstream pressure reaches the preset value.

7. Backflow Preventers: Backflow preventers will be provided to prevent contamination of water supplies by transient unfavorable pressure gradients which might otherwise cause reversal of flow. There will be either double-check valves or reduced-positive-pressure valves. The former close when flow reverses and the latter when the pressure drops, thus providing an additional margin of safety. The type used depends upon the application and the level of risk to the general public.

8. Fitting and Valve Standards. All required fittings and valves shall be placed into the water distribution system according to the California Waterworks Standards, California Health and Safety Code, California Administrative Code Title 22, the EPA, and OPUD Standards. This includes gate valve clusters at each intersection for the partial system isolation, air vacuum/release valves, check valves, backflow prevention devices, meter valves, water meter, sample ports, etc.

3.6 Geometric Layout

The geometric layout of the system is based on the layout of the MRSP and the 2030 General Plan zoning. The water mains will be located within road rights-of-way. The project will construct offsite trunk line(s) to connect to new storage and ground water well facilities. Figure 3.1 on a next page shows the conceptual layout of the domestic water system.



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Symbol	Description	Date	Approved

Rev. 100%

Date: 04-30-13
Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:

Designed by: MHM INCORPORATED
Dwn by: SMM
Reviewed by: JMS
Submitted by:
Sean M Minard RCE 52593

FIGURE 3-1
SANITARY SEWER
MASTER PLAN

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 3-1

Dwg.:13-122

TABLE NO. 3.4
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
WATER STUDY - FLOW CALCULATIONS

Neighborhood Number	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent DU	gpd/acre	gpd/unit	Average Day Water Demand (gpd)	Average Day Water Demand (AFY)	Maxium Day Water Demand (gpd)	Maxium Day Peak Hour Water Demand (gpm)
MRSP-1A	1	DRNG-1	3.25	3.25	Drainage Open-Space										
MRSP-1A	2	DRNG-2	2.30	2.30	Drainage Open-Space										
MRSP-1A	3	DRNG-3	2.42	2.42	Drainage Open-Space										
MRSP-1A	4	DRNG-4	3.34	3.34	Drainage Open-Space										
MRSP-1A	5	DRNG-5	3.32	3.32	Drainage Open-Space										
MRSP-1A	6	LDR-1	13.04		LDR	5	5.1	67	67		600	40,200	45.0	48,240	57
MRSP-1A	7	LDR-2	13.62		LDR	5	5.1	69	69		600	41,400	46.4	49,680	59
MRSP-1A	8	LDR-3	16.67		LDR	5	4.5	75	83		600	50,012	56.0	60,015	71
MRSP-1A	9	LDR-4	17.67		LDR	5	4.6	81	88		600	52,998	59.4	63,597	75
MRSP-1A	10	PARK-1	3.85	2.99	Park					2,988		8,934	10.0	5,386	6
MRSP-1A	11	LDR-5	14.25		LDR	5	4.5	64	71		600	42,763	47.9	51,316	61
MRSP-1A	12	LDR-6	11.12		LDR	5	4.4	49	56		600	33,352	37.4	40,023	47
MRSP-1A	13	LDR-7	12.34		LDR	5	4.0	49	62		600	37,021	41.5	44,426	52
MRSP-1A	14	LDR-8	13.26		LDR	5	3.9	52	66		600	39,772	44.6	47,726	56
MRSP-1A	15	PARK-2	2.83	2.37	Park					2,988		7,082	7.9	3,962	5
MRSP-1A	16	BP-1	57.34	57.34	Bussiness Park					2,598		148,969	166.9	80,272	95
MRSP-1A	17	NC-1	2.76	2.76	Neighborhood Commercial					2,598		7,170	8.0	3,859	5
MRSP-1A	18	FIRE-1	1.75	1.75	Fire Station					1,780		3,115	3.5	2,451	3
MRSP-1A	19	MPOS-1	17.72	16.41	Drainage Open-Space										
MRSP-1A	20	LDR-9	7.65		LDR	5	3.4	26	38		600	22,938	25.7	27,526	32
MRSP-1A	21	LDR-10	5.66		LDR	5	3.7	21	28		600	16,993	19.0	20,392	24
MRSP-1A	22	LDR-11	9.80		LDR	5	4.5	44	49		600	29,405	32.9	35,286	42
MRSP-1A	23	MS-1	15.93	15.00	Middle School					3,454		51,810	58.0	22,300	26
MRSP-1A	24	ES-1	12.38	12.00	Elementary School					3,454		41,448	46.4	17,338	20
MRSP-1A	25	LDR-12	13.90		LDR	5	4.5	63	70		600	41,711	46.7	50,053	59
MRSP-1A	26	LDR-13	17.30		LDR	5	4.5	78	86		600	51,885	58.1	62,262	74
MRSP-1A	27	LDR-14	14.05		LDR	5	4.4	62	70		600	42,150	47.2	50,580	60
MRSP-1A	28	LDR-15	14.89		LDR	5	4.0	60	74		600	44,659	50.0	53,591	63
MRSP-1A	29	LDR-16	15.40		LDR	5	3.4	52	77		600	46,214	51.8	55,456	65
MRSP-1A	30	LDR-17	11.69		LDR	5	3.6	42	58		600	35,057	39.3	42,069	50
MRSP-1A	31	LDR-18	20.10		LDR	5	4.3	87	101		600	60,311	67.6	72,373	85
MRSP-1A	32	LDR-19	11.31		LDR	5	3.7	42	57		600	33,937	38.0	40,724	48
MRSP-1A	33	LDR-20	18.71		LDR	5	4.7	88	94		600	56,127	62.9	67,353	80
MRSP-1A	34	PARK-3	6.01	4.99	Park					2,988		14,910	16.7	8,408	10
MRSP-1A	35	LDR-21	19.69		LDR	5	4.5	88	98		600	59,058	66.2	70,869	84
MRSP-1A	36	LDR-22	15.20		LDR	5	3.9	60	76		600	45,608	51.1	54,730	65
MRSP-1A	37	PARK-4	6.60	5.49	Park					2,988		16,404	18.4	9,244	11
MRSP-1A	38	LDR-23	15.93		LDR	5	4.4	70	80		600	47,803	53.5	57,364	68
MRSP-1A	39	LDR-24	6.03		LDR	5	5.1	31	31		600	18,600	20.8	22,320	26
MRSP-1A	40	VLDR-1	8.23		VLDR	4	2.7	22	33		728	23,968	26.8	28,761	34
MRSP-1A	41	VLDR-2	8.47		VLDR	4	3.3	28	34		728	24,675	27.6	29,610	35
MRSP-1A	42	VLDR-3	14.50		VLDR	4	1.7	25	58		728	42,236	47.3	50,683	60
MRSP-1A	43	MPOS-2	6.63	5.68	Drainage Open-Space										
MRSP-1A	44	PARK-5	7.09	5.93	Park					2,988		17,719	19.8	9,926	12
MRSP-1A	45	LDR-25	24.24		LDR	5	3.2	77	121		600	72,721	81.5	87,265	103
MRSP-1A	46	LDR-26	9.29		LDR	5	5.0	46	46		600	27,865	31.2	33,438	39
MRSP-1A	47	LDR-27	8.37		LDR	5	4.3	36	42		600	25,097	28.1	30,117	36
MRSP-1A	48	PARK-6	16.68	15.97	Park				96	2,988		47,718	53.5	23,354	28
MRSP-1A	49	LDR-28	17.17		LDR	5	3.9	67	86		600	51,496	57.7	61,796	73
MRSP-1A		Roads	80.00		Roads										
MRSP Phase 1 Subtotal			**671.73**	**163.30**				**1,721**	**2,166**			**1,623,314**	**1,818**	**1,696,143**	**2,002**

TABLE NO. 3.4
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
WATER STUDY - FLOW CALCULATIONS

Neighborhood Number	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent ESD	gpd/acre	gpd/unit	Average Day Water Demand (gpd)	Average Day Water Demand (AFY)	Maxium Day Water Demand (gpd)	Maxium Day Peak Hour Water Demand (gpm)
MRSP-2A	50	LDR-29	16.55		LDR	5	5.0	82	83		600	49,645	55.6	59,574	70
MRSP-2A	51	MDR-1	13.48		MDR	7	6.4	86	94		430	40,568	45.4	48,681	57
MRSP-2A	52	MDR-2	7.34		MDR	7	6.5	48	51		430	22,099	24.8	26,519	31
MRSP-2A	53	MDR-3	7.25		MDR	7	6.8	49	51		430	21,808	24.4	26,170	31
MRSP-2A	54	HDR-1	8.25	7.61	HDR	20	20.0		124		177	21,941	24.6	26,329	31
MRSP-2A	55	NC-2	11.34	10.93	Neighborhood Commercial					2,598		28,396	31.8	15,880	19
MRSP-2A	56	LDR-30	12.88		LDR	5	5.0	65	64		600	38,653	43.3	46,383	55
MRSP-2A	57	LDR-31	14.10		LDR	5	4.5	64	71		600	42,314	47.4	50,777	60
MRSP-2A	58	HDR-2	6.26	5.72	HDR	20	20.0		94		177	16,657	18.7	19,989	24
MRSP-2A	59	NC-3	3.68	3.54	Neighborhood Commercial					2,598		9,197	10.3	5,149	6
MRSP-2A	60	HDR-3	3.69		HDR	20	20.0		55		177	9,821	11.0	11,785	14
MRSP-2A	61	MDR-4	9.06		MDR	7	6.2	56	63		430	27,257	30.5	32,708	39
MRSP-2A	62	LDR-32	6.55		LDR	5	4.6	30	33		600	19,660	22.0	23,592	28
MRSP-2A	63	PARK-7	6.03	5.99	Park					2,598		15,562	17.4	8,447	10
MRSP-2A	64	LDR-33	16.49		LDR	5	4.4	72	82		600	49,466	55.4	59,359	70
MRSP-2A	65	LDR-34	7.48		LDR	5	5.4	40	40		600	24,000	26.9	28,800	34
MRSP-2A	66	LDR-35	10.48		LDR	5	4.8	50	52		600	31,439	35.2	37,726	45
MRSP-2A	67	LDR-36	6.85		LDR	5	5.1	35	35		600	21,000	23.5	25,200	30
MRSP-2A	68	LDR-AR-37	19.08		LDR-AR	5	5.0	95	81		521	42,325	47.4	50,790	60
MRSP-2A	69	LDR-AR-38	8.82		LDR-AR	5	4.3	38	38		521	19,576	21.9	23,491	28
MRSP-2A	70	LDR-AR-39	23.72		LDR-AR	5	3.8	90	101		521	52,633	59.0	63,159	75
MRSP-2A	71	LDR-AR-40	14.06		LDR-AR	5	3.4	48	60		521	31,183	34.9	37,420	44
MRSP-2A	72	MPOS-3	15.86	15.86	Drainage Open-Space										
MRSP-2A	73	PARK-8	4.62	3.96	Park					2,598		10,288	11.5	6,472	8
MRSP-2A	74	CLUB-1	2.24	1.96	Clubhouse					1,780		3,489	3.9	3,143	4
MRSP-2A	75	LDR-AR-41	13.72		LDR-AR	5	4.5	62	58		521	30,447	34.1	36,537	43
MRSP-2A	76	LDR-AR-42	13.25		LDR-AR	5	4.2	56	56		521	29,402	32.9	35,283	42
MRSP-2A	77	LDR-AR-43	14.29		LDR-AR	5	4.5	64	61		521	31,701	35.5	38,041	45
MRSP-2A	78	LDR-AR-44	20.19		LDR-AR	5	4.2	84	86		521	44,797	50.2	53,757	63
MRSP-2A	78	LDR-AR-44	20.19		LDR-AR	5	2.7	48	86		521	44,797	50.2	53,757	63
MRSP-2A		Roads	20.00		Roads										
MRSP Phase 2 Subtotal			**357.82**	**55.57**				**1,262**	**1,621**			**830,121**	**930**	**954,918**	**1,127**
MRSP Project Total			**1,029.56**	**218.87**				**2,983**	**3,787**			**2,453,436**	**2,748**	**2,651,061**	**3,130**

TABLE NO. 3.4
STATE ROUTE 65 EMPLOYMENT VILLAGE / MAGNOLIA RANCH SPECIFIC PLAN
WATER STUDY - FLOW CALCULATIONS

Neighborhood Number	Unit Number	Unit Description	Unit Gross Acreage	Planned Net Acreage	Land Use	Design Unit Density	Lotted Unit Density	Residential Lot Count	Design Equivalent ESD	gpd/acre	gpd/unit	Average Day Water Demand (gpd)	Average Day Water Demand (AFY)	Maxium Day Water Demand (gpd)	Maxium Day Peak Hour Water Demand (gpm)
EV-3A	1	LDR-1	90		LDR	5		450	450		600	270,000	302.4	324,000	383
EV -3A	2	LDR-2	10		LDR	5		50	50		600	30,000	33.6	36,000	43
EV -3A	3	LDR-3	30		LDR	5		150	150		600	90,000	100.8	108,000	128
EV -4A	4	VLDR-1	80		VLDR	4		320	320		728	232,960	260.9	279,552	330
EV -4A	5	VLDR-2	60		VLDR	4		240	240		728	174,720	195.7	209,664	248
EV -1B	6	IN-IND-1	130		IND					2,562		333,060	373.1	182,000	215
EV -3B	7	IN-IND-2	130		IND					2,562		333,060	373.1	182,000	215
EV -3B	8	IN-IND-3	85		IND					2,562		217,770	243.9	119,000	140
EV -4B	9	HC-1	50		COM					2,598		129,900	145.5	70,000	83
EV -4B	10	HC-2	70		COM					2,598		181,860	203.7	98,000	116
EV -3B	11	BP-1	30		BP					2,598		77,940	87.3	42,000	50
EV -3B	12	BP-2	80		BP					2,598		207,840	232.8	112,000	132
EV -3B	13	BP-3	80		BP					2,598		207,840	232.8	112,000	132
EV -2B	14	OUT-IND-1	100		IND					2,598		259,800	291.0	140,000	165
EV -2B	15	OUT-IND-2	65		IND					2,598		168,870	189.2	91,000	107
EV -1B	16	OUT-IND-3	150		IND					2,598		389,700	436.5	210,000	248
EV -3B	17	OUT-IND-4	130		IND					2,598		337,740	378.3	182,000	215
EV -3B	18	OUT-IND-5	170		IND					2,598		441,660	494.7	238,000	281
EV -1B	19	OUT-IND-6	30		IND					2,598		77,940	87.3	42,000	50
EV -1B	20	OUT-IND-7	135		IND					2,598		350,730	392.9	189,000	223
EV -1B	21	RR-1	45		VLDR	4		180	180		728	131,040	146.8	157,248	186
EV	22	OS	110		Drainage Open-Space										
EV	23	OS	150		Roads										
Employment Village (outside MRSP) Subtotal			**2,010.00**	**0.00**				**1,390**	**1,390**			**4,644,430**	**5,202**	**3,123,464**	**3,687**
Employment Village Total			**3,039.56**	**218.87**				**4,373**	**5,177**			**7,097,866**	**7,951**	**5,774,525**	**6,817**

3.7 Hydraulic Analysis

A hydraulic analysis of the proposed system has not been conducted at this time. Prior to beginning the design with the MRSP water system an analysis will be performed. Table 3.5 summarizes some of the key criteria to be used for the hydraulic analysis. These criteria are within the typical range used by other similar agencies.

Table No. 3.5 – Hydraulic Analysis Criteria

System Criteria		
Peaking Factors	Average Day Maximum Day Peak Hour	1.0 2.0 3.4
Allowable Pressure	Normal Operation max pressure Normal Operation min pressure Peak Hour min pressure Max Day plus Fire-Flow min pressure	60 psi 40 psi 30 psi 20 psi
Allowable Velocities	Max Day and Peak Hour max velocity Max Day plus Fire-Flow max velocity	7 fps 10 fps
Head losses	Maximum Desirable	10 ft. / 1,000 ft. 5 ft./ 1,000 ft.
Hazen Williams “C” Factor	New Pipes Existing Pipes	130 100
Water Well Production	New Water Wells	1,850 – 2250 gpm*

*The system should be modeled with a typical pump curve that yields the approximate range.

3.8 Pipe Selection

The type of pipe used for the closed conduit will meet all OPUD requirements. There are three different pipe alternatives which meet the design requirements. The pipes are as follows:

1. High Density Polyethylene (HDPE) Pipe. The pipe shall be 100 psi (DR17) minimum and conform to the requirements of AWWA C906. All joints and fittings shall be by

the butt fusion method. All fittings shall conform to AWWA C906 requirements.

2. Ductile-Iron (DIP) Pipe. The pipe shall be Class 250 minimum and conform to the requirements of AWWA C151 for ductile-iron pipe. The fittings shall conform to AWWA C110 for cost iron fittings and C111 for rubber gasket joints. All flanged fittings shall conform to AWWA C110.

3. Polyvinyl (PVC) Pipe. The pipe shall be 165 psi (SDR25) PVC 1120 ASTM D 1784 (12454-B) minimum and conform to the requirements of AWWA C905 or AWWA C900. The polyvinyl chloride pipe joints shall be rubber rings conforming to ASTM F477 and have joint meeting or exceeding the requirements of ASTM D 3139.

A forth pipe is also considered on a limited scale to be used for locations where bore and jacking is required. The pipe is as follows:

4. Welded Steel Pipe (ST). The pipe shall be ten (10) gauge minimum and conform to the requirements of AWWA Designation: C 200; ASTM Designation: A 53, Grade B; API Specification 5L, Grade B; API Specification 5LX, Grade X42. The field welding shall be performed in accordance with the specifications of AWWA Designation: C206.

3.9 Protection of Water Quality

Although the water produced from wells by OPUD meets stringent quality standards as it leaves the source, it may deteriorate as it passes through the distribution system. Organic materials may pass through the walls of plastic pipe and metals may dissolve from pipe or solder. Additionally, autotrophic bacteria can grow within the pipes using carbonate and bicarbonate ion alkalinity of the water as the sole carbon source. The organic matter produced by this growth can then support other microbial life and result in taste, odor, and color problems. The system will be designed to prevent this from occurring. Systems can use five primary operation procedures to maintain water quality: (1) minimize bulk water detention time, (2) maintain positive pressure, (3) control the direction and velocity of the bulk water, (4) maintain a disinfectant residual in the distribution, and (5) prevent cross-connections and backflow. Backflow preventers will be used to prevent backflow at required cross-connections.

3.10 Summary and Recommendations

Since the water system for the State Route 65 Employment Village will be all new and independent of any existing systems, the new system will have to be developed with the start of development. The Magnolia Ranch Specific plan will be the first development in the Employment Village and has begun the process with the Water Supply Assessment. For the first phase of the MRSP development, the MRSP will further develop its water infrastructure master plan and design with modeling, test well, and well development. This information could then be used to develop a more accurate and extensive plan for the complete State Route 65 Employment Village water system.

4 - Storm Drainage

4.1 Background for the Proposed Improvements

The purpose of this drainage study is to define at a conceptual level the storm runoff improvement facilities and the design criteria to be used in proceeding with development of the State Route 65 Employment Village in Yuba County. Key to this report will be the comparison of runoff before and after development and its effect on delivered storm water immediately downstream from the project. Facilities specific to the SR65 Employment Village Area covered by this report are the preliminary location and sizing of detention ponds, pump stations, overflow structures and preliminary routing and sizing of the main underground storm drainage system. The design will meet the standards specified by Yuba County and support the water quality concepts and policies of the Yuba County 2030 General Plan. The conceptual design will meet the four goals of: (1) not increasing peak storm water runoff from the study area, (2) not increasing the duration of significant runoff from the study area, (3) not increase the 48-hour total quantity of runoff from the study area, and (4) embrace the concepts of the Yuba County General Plan in regard to water quality.

4.2 Study Area and Design Overview

The proposed State Route 65 Employment Village Plan is a planned development of mixed residential, parks, schools, commercial, industrial and business areas. The study area comprises about 3050 acres located in southern Yuba County several miles northwest of the City of Wheatland. The area is roughly located south of Ostrom Road, northwest of South Beale Road and northeast of Rancho Road. Approximately one-third of the region is in the planned Magnolia Ranch Specific Plan area, located in the eastern part of the State Route 65 Employment Village Plan area. Drainage in that eastern portion has been previously analyzed in the “Basis of Design Report, Magnolia Ranch Specific Plan, Proposed Drainage Improvements, Preliminary Analysis” done by MHM Incorporated in August 2012 (please see the reference section at the end of this report for a list of pertinent documents). The study area has been in agricultural use for many years, much of it in rice farming. The Magnolia Ranch portion is currently fully-utilized for rice farming. The main part of study area has historically drained to Kimball Creek which is between the watershed areas for Hutchinson Creek just north and Best Slough just south. A smaller south portion of the study area has historically drained to two minor branches of Best Slough. A large area of agricultural fields north of Ostrom Road, outside the study area drains into the study area near the intersection of Ostrom Road and Virginia Road. That outside area is not considered for development under this study. Thus the inflow from that area will be considered unchanged from current conditions under the developed conditions for the State Route 65 Employment Village Plan.

The USGS Quad map indicating the region under consideration in this report with the major pertinent features identified is shown in Figure 4-1. The conditions shown represent historic conditions, but with the planned State Route 65 Employment Village Plan delineated for the purpose of orienting the reader. The historic inflow and outflow drainage routes shown in Figure 4-1 will continue to be utilized after development.

The primary purpose of this drainage study is to provide design tools and information to ensure that the State Route 65 Employment Village Plan will not pose flood risks to residents both onsite and downstream. An interrelated purpose is to ensure that water quality is not impacted both within SR65 Employment Village and downstream. Quoting from the August 2009 Technical Advisory *CEQA and Low Impact Storm Water Design* from the Governor's Office of Planning and Research:

> *Surface runoff from developed areas is a leading source of non-point source water pollution in California. As roofs and pavement cover natural landscapes, rain and snowmelt no longer soak into the ground. Instead, storm drains carry large amounts of runoff directly to streams and other water bodies. Increased flow may cause stream beds and banks to erode, damaging or eliminating stream habitat and carrying sediment downstream. Runoff from roofs and pavement also flushes sediment, oil, grease, pesticides, nutrients, bacteria, trash, and heavy metals into streams, lakes, estuaries, and the ocean. Projects that replace previously undeveloped land with new impervious surfaces, or redevelopment that increases impervious surfaces, may contribute to such water quality impacts individually and cumulatively with other development.*

This is the issue being addressed by the policies in Goal HS3 of the Yuba County General Plan Update of 2011. Much of the concern expressed in the above quote will be dealt with as a consequence of the flood control efforts. For instance, the detention ponds will serve as settling basins, infiltration basins and will produce downstream flows lower than current conditions. This in turn will eliminate off-site transport of sediments, many pollutants and trash. Furthermore, the low off-site flows that will be achieved by the storm drain system will eliminate concerns about erosion downstream.

Hydrologic runoff has been modeled using HEC-1 for both pre-development and post-development conditions. The post-development conditions for the Magnolia Ranch area have also been analyzed with HEC-RAS for the purpose of sizing ponds, outfall structures, pumps and trunk lines. Sizing of ponds, the pump and outfall structures for the main portion of the State Route 65 Employment Village Plan area have been analyzed with HEC-1. Individual storm drain trunk lines utilized HEC-RAS to determine optimum sizing. An extensive aerial topographic survey of the project site was used to establish current condition runoff routes. The datum used for all referenced elevations in this study is NGVD 1929. For the hydrologic conditions before and after the State Route 65 Employment Village Plan, the runoff parameters were estimated based on the current and planned usage, the soil properties from the USDA Web Soil Survey site and the topography from the aerial survey of Magnolia Ranch, available LiDAR over the entire area and a limited amount of recent ground surveys by MHM Incorporated.

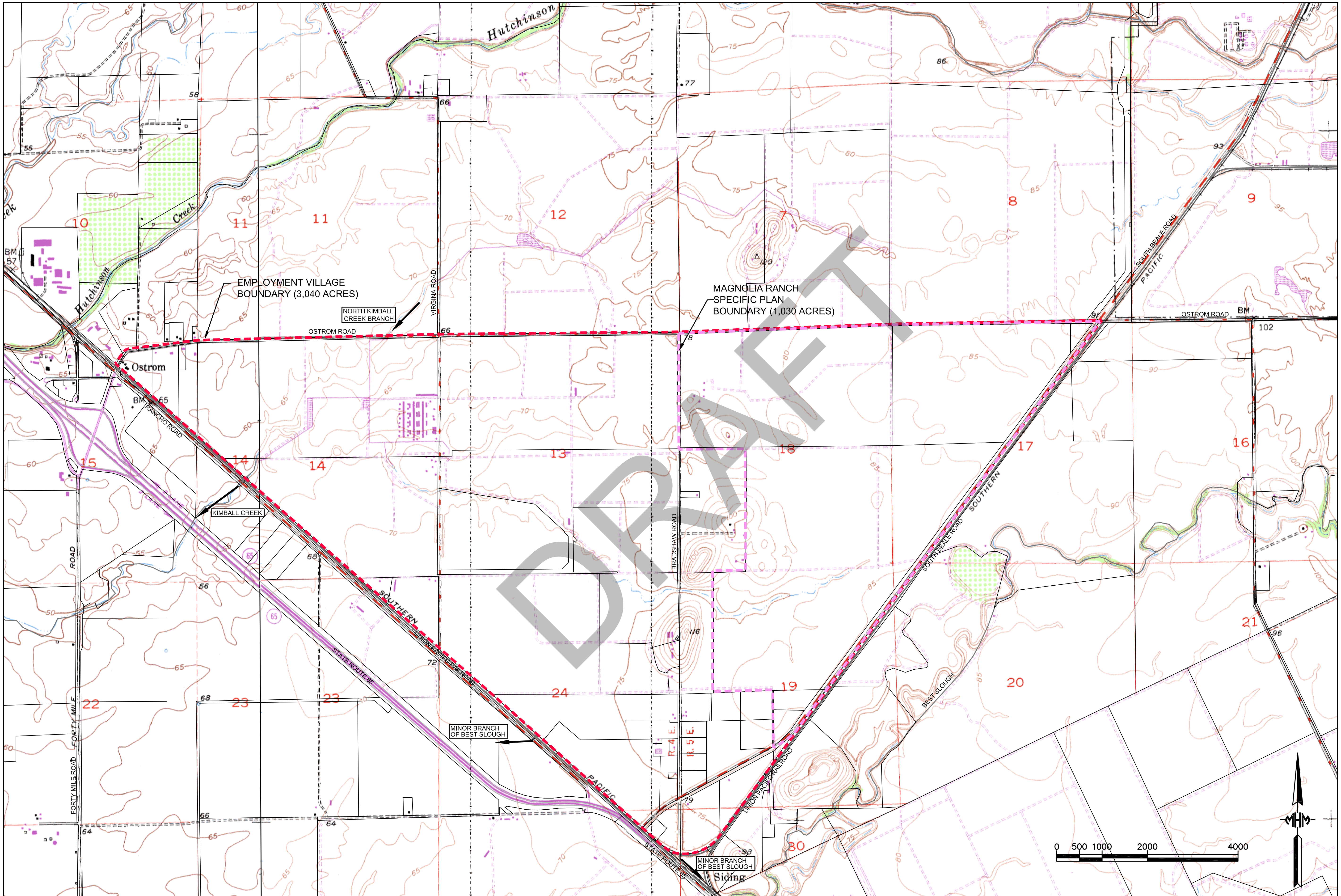
Figure 4-2 shows the current situation with near 100% of the study area under cultivation, and with nearly all of the Magnolia Ranch project area in rice production. The fate of all Magnolia Ranch Specific Plan runoff is Kimball Creek that flows generally westward from Bradshaw Road. The discharge points from Magnolia Ranch are at Bradshaw Road. The main one is about half way between Ostrom Road and S. Beale Rd. A secondary discharge point is about 2000 feet south of Ostrom Rd. Both points will continue to be utilized for runoff discharge which will travel across the State Route 65 Employment Village Plan area via existing ditches/creeks to the Kimball Creek discharge at Rancho Road. The project area receives upstream runoff from the north branch of Kimball Creek near the corner of Ostrom and Virginia Roads. That inflow point and all outflow points are shown in Figure 4-1.

As described above, the outflow to Kimball Creek (both currently and to be preserved after development) handles all runoff from the Magnolia Ranch area and the north two-thirds (m/l) of the remaining portion of the State Route 65 Employment Village Plan area. The south third (m/l) of the State Route 65 Employment Village Plan area (both currently and upon development) drains to two branches of Best Slough. The area surrounding the intersection of South Butte Rd. and Bradshaw Road drains southward in a ditch just south of Bradshaw Road, under the railroad and then next to SR65 to Best Slough. The agricultural fields just north of South Butte Rd. and west of Bradshaw Rd. drain to the west to a branch of Best Slough at Rancho Rd.

The analysis in this study is intended to identify facilities capable of limiting peak flows off the site to levels below the current values under near 100% farming. Thus two main simulations will be presented: (1) runoff models for "Current Conditions" recognizing the large amount of rice and other agricultural development, and (2) runoff models under "Developed Conditions" representing full development of the State Route 65 Employment Village Plan and its associated drainage facilities. Both of those conditions have been run for three storm events: the 10-year 24-hour, the 25-year 24-hour and the 100-year 24-hour. As per Yuba County standards, the storm drain lines will be designed to pass the 10-year storm, the main trunk lines will be designed to pass the 25-year storm and the pond/pump capacities will be designed to accommodate the 100-year storm.

The proposed land use for the State Route 65 Employment Village Plan is shown in Figure 4-3a, b and c. The drainage improvements will be discussed later, but will include underground storm trunk lines, detention ponds, pond interconnections, sized outlet structures and pump stations. The primary features of the drainage improvements proposed are identified in Figure 4-3a, b and c. Under all storm conditions, the design will:

1. Deliver runoff only to the historic discharge points.
2. Produce peak outflows lower than the outflows produced during storms from the current use under rice and other farming.
3. Produce durations of significant outflows shorter than the current condition outflows.
4. Deliver a total quantity of storm water off site during a 48-hour period (the 24-hour storm and the next 24 hours following the storm) which does not exceed the current total.
5. Continue to accept and transport the inflow of offsite runoff from the north branch of Kimball Creek at Ostrom Road.
6. Utilize water quality concepts from the Yuba County 2030 General Plan to achieve pre-treatment of storm water before it enters the storm drain system and again as it enters and resides in the onsite detention ponds.



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Symbol	Description	Date	Approved

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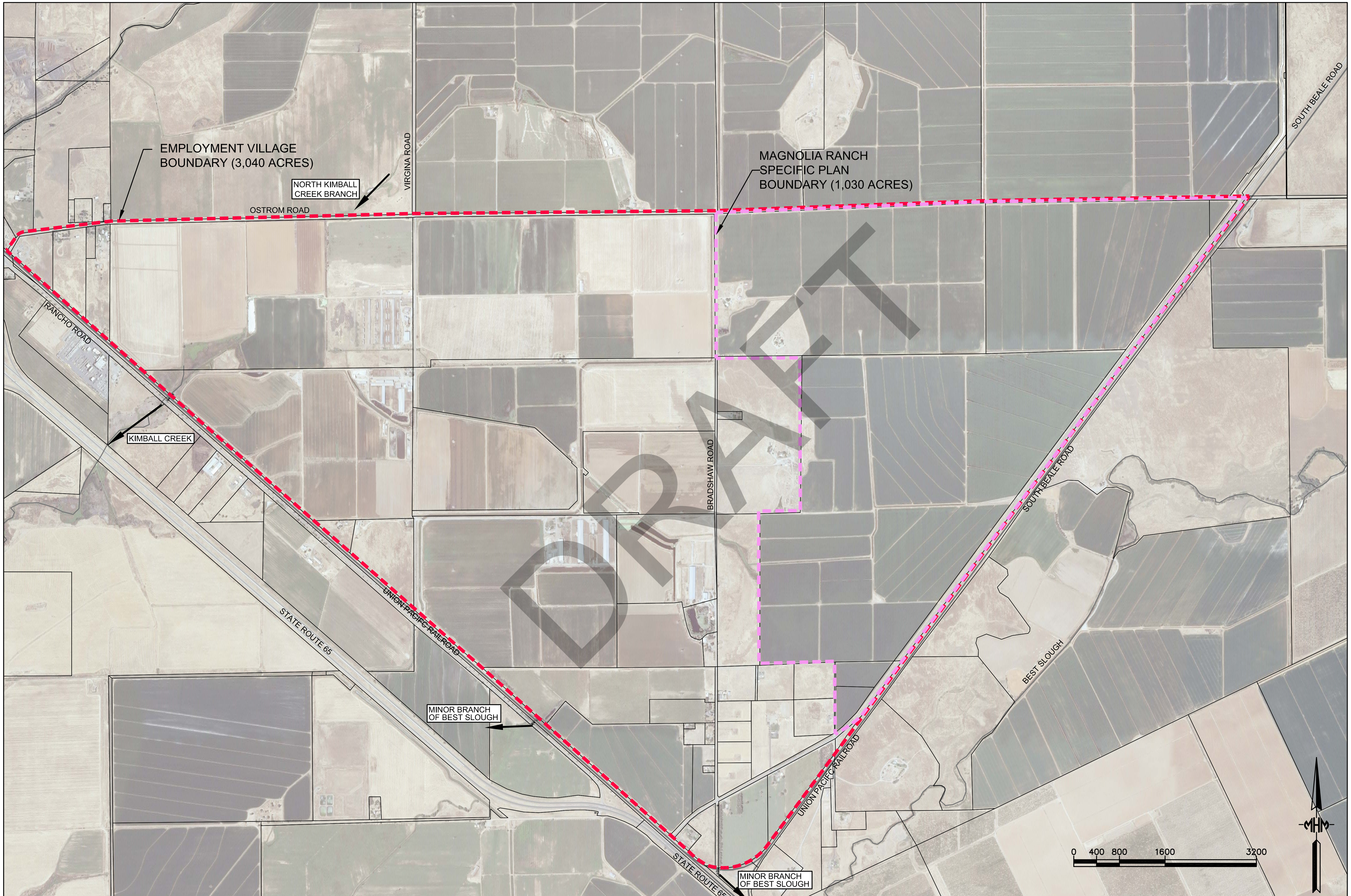
Date: 04-30-13
Rev. 100%
Dwn by: SMM
Reviewed by: JMS
Design file no: 13122
Submitted by:
Drawing Code:
Sean M Minard RCE 52593
File name:
Plot date: 04-30-13
Plot scale:

FIGURE 4-1
USGS QUADRANGLE MAP
WITH INFLOW / OUTFLOW

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-1

Dwg.:13-122



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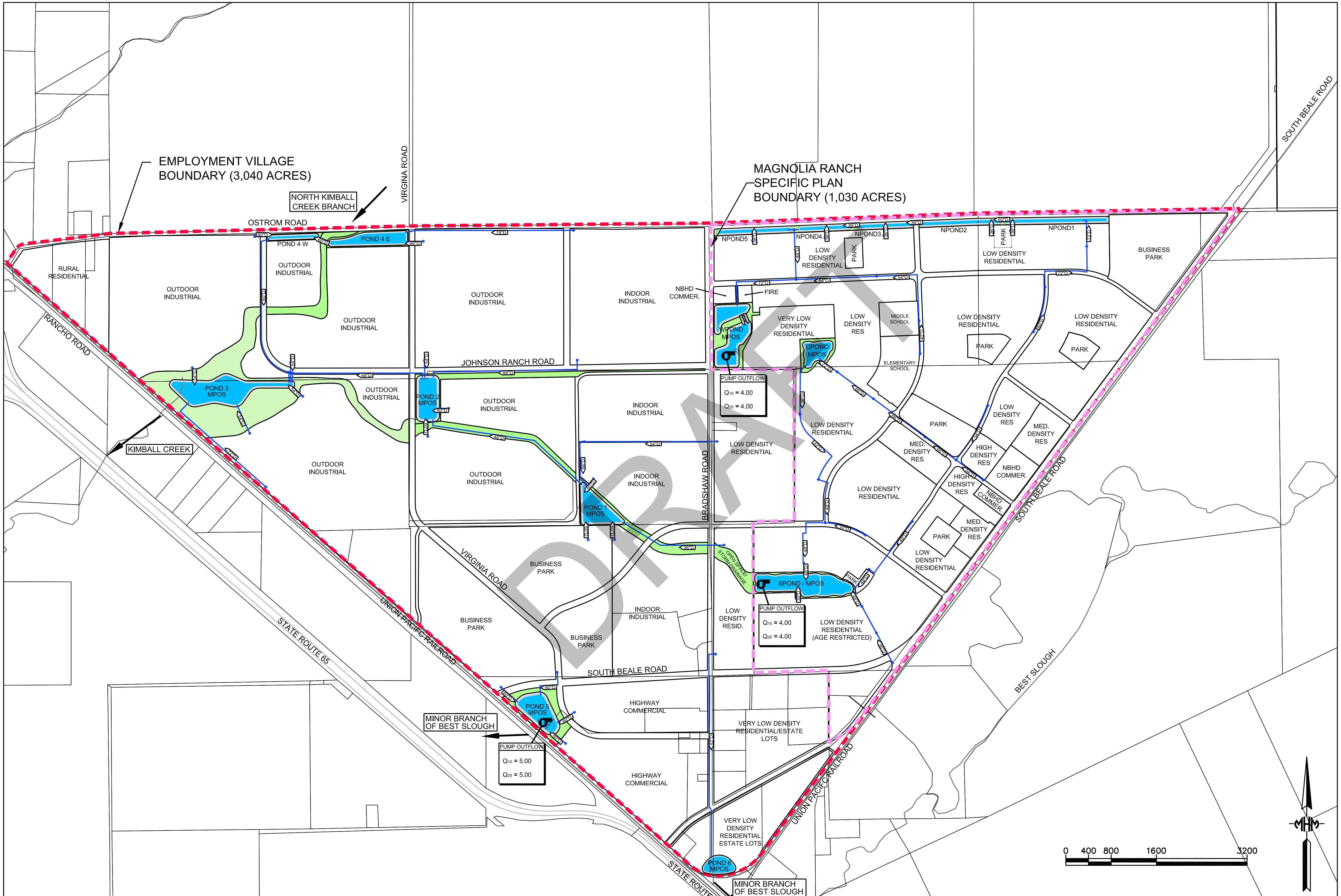
Submitted by:	Drawing Code:	
Sean M Minard RCE 52593	File name: / Plot date: 04-30-13 / Plot scale:	

FIGURE 4-2
PROJECT AREA SHOWING
CURRENT FARMING EXTENT

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-2

Dwg.:13-122



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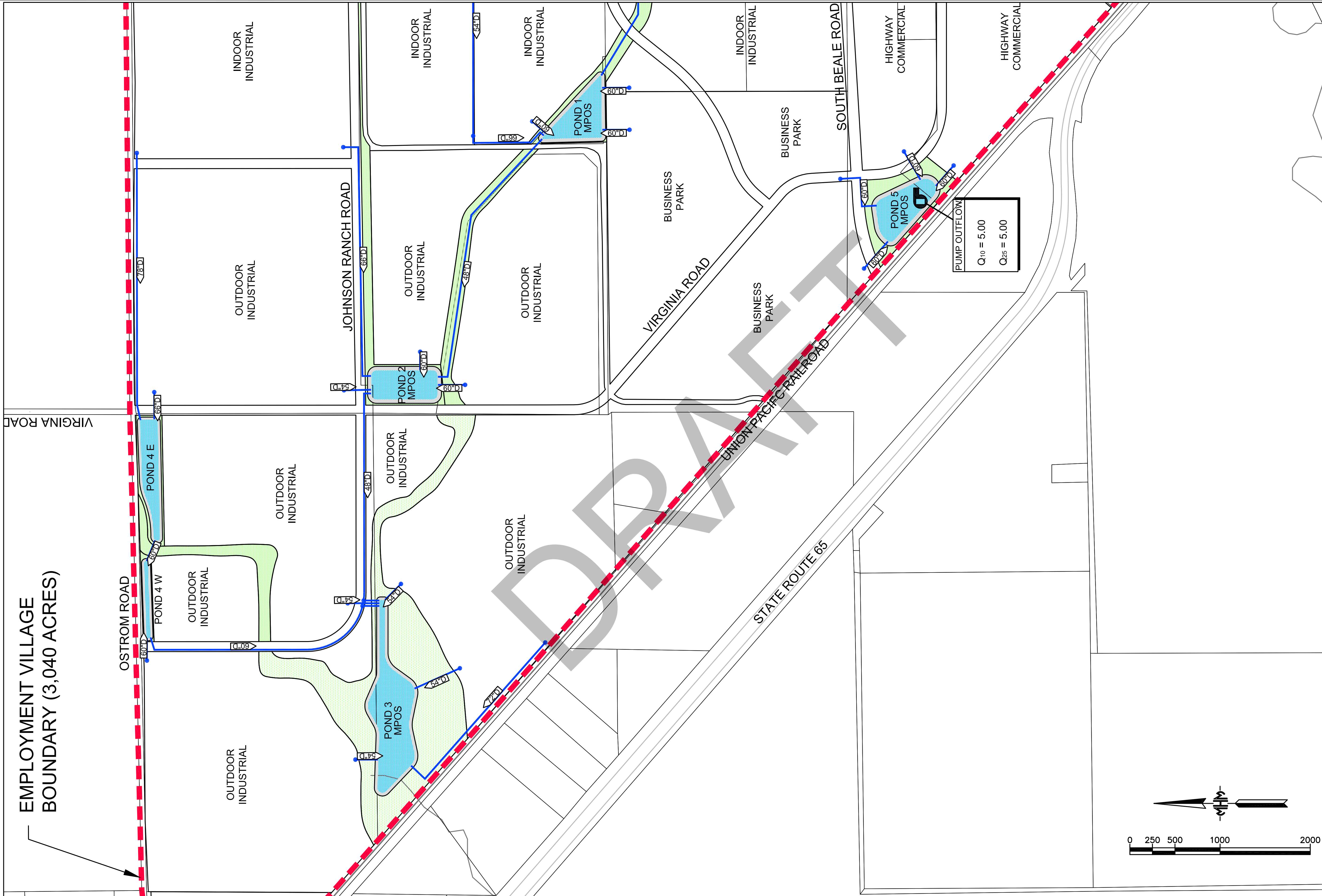
Design file no: 13122
Drawing Code:
File name: 04-30-13
Plot scale:
Designed by: MHM INCORPORATED
Dwn by: SMM
Reviewed by: JMS
Submitted by:
Sean M Minard RCE 52593

FIGURE 4-3a
LAND USE PLAN
OVERALL

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-3a

Dwg.:13-122



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Reviewed by: JMS
Submitted by:
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Rev. 100%
Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:

FIGURE 4-3b
LAND USE PLAN
WEST

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-3b

Dwg.:13-122

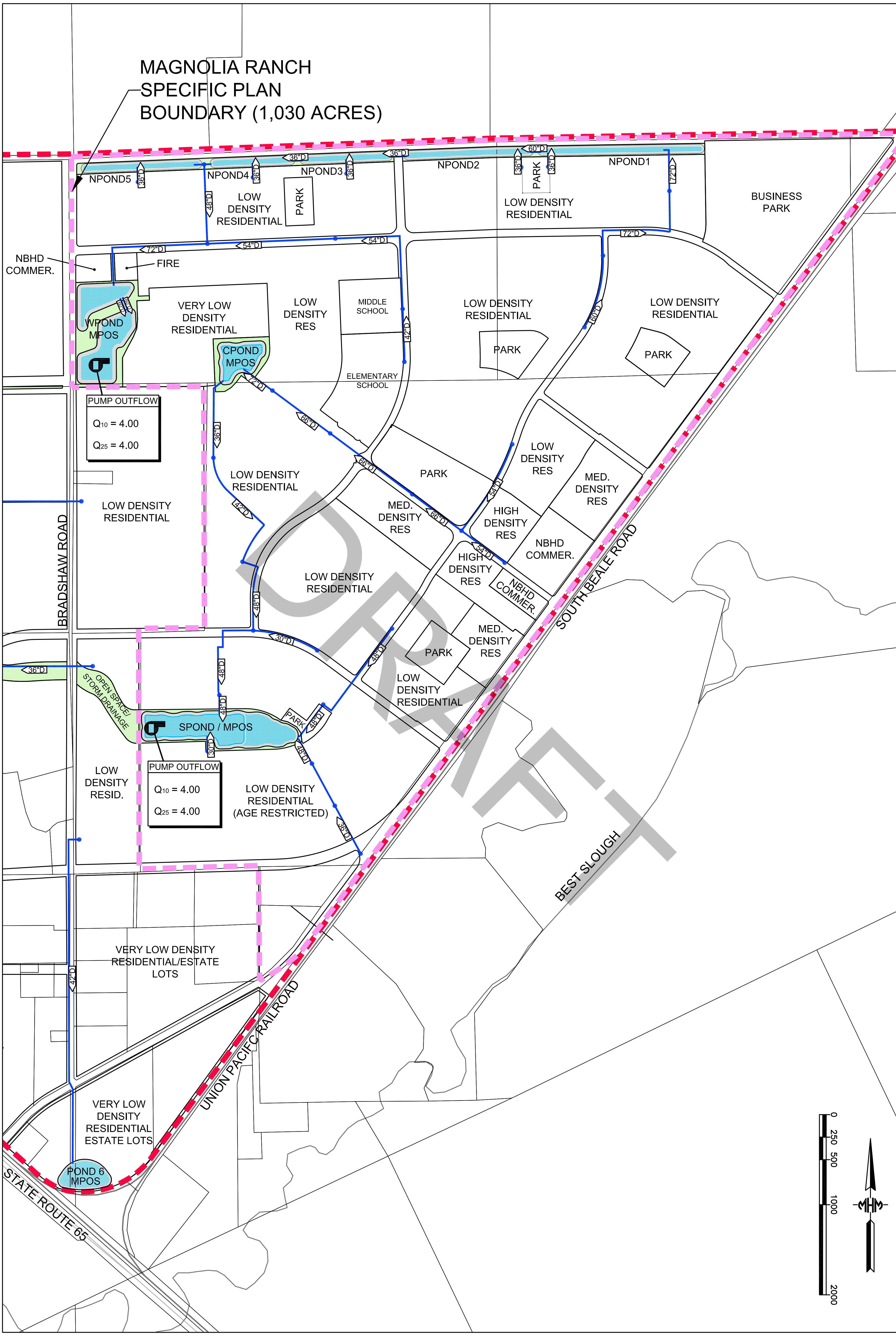

FIGURE 4-3c
LAND USE PLAN
EAST

Designed by: MHM INCORPORATED
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Drawing Code:
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Plot scale:

Symbol	Description	Date	Approved

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Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-3c

Dwg.:13-122

4.3 Description of Proposed Improvements

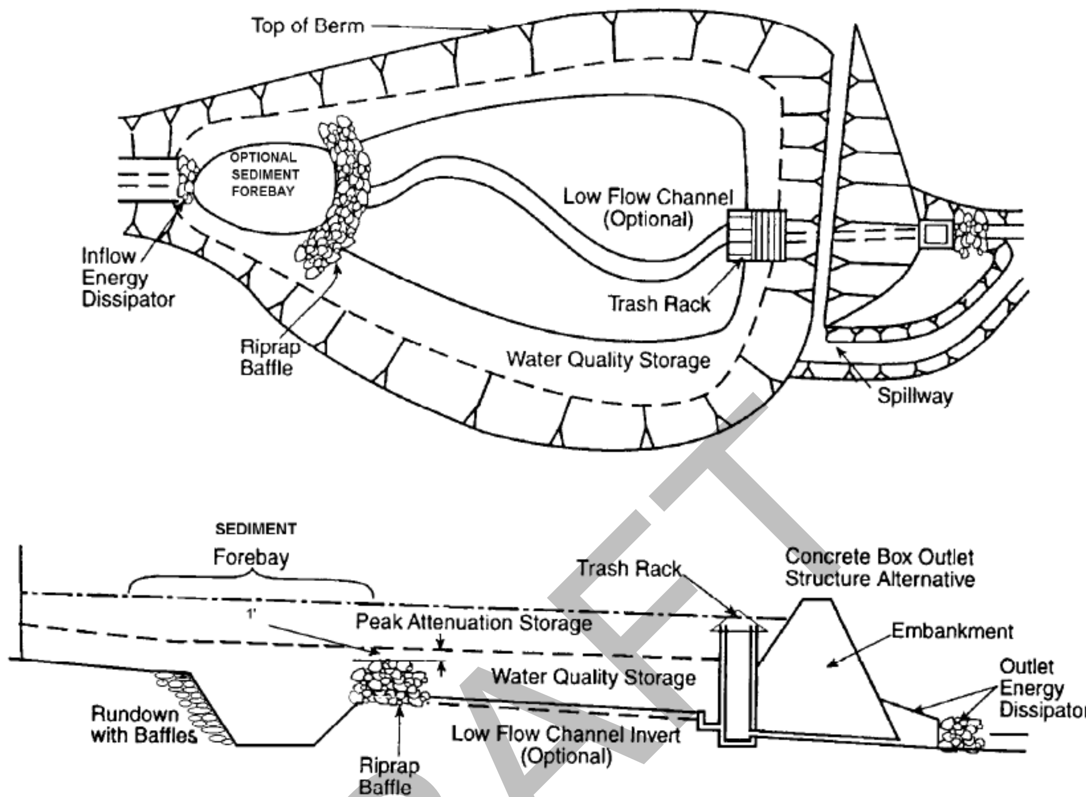
Much of the State Route 65 Employment Village Plan area is currently in use for rice and other farming. The eastern part of the study area, the Magnolia Ranch Specific Plan area, is currently nearly 100% rice farming and there are significant areas of rice farming in the remaining portion of the State Route 65 Employment Village Plan area. The rice checks (and to a certain extent, other forms of farming) provide existing storm water storage through agricultural ponding. During large storms a check must fill, then spill to the next lower check, and that may continue through a number of checks before producing significant downstream outflow. The situation produces delayed outflows with much smaller peak values than would have existed naturally. The State Route 65 Employment Village residential, industrial and commercial development will of course result in much quicker and more intense runoff to the storm drain system. To mitigate the developed offsite runoff, a distributed system of detention ponds will be required. The series of ponds will allow all of State Route 65 Employment Village drainage to be directed into a nearby system of detention ponds. The short runs and relatively deep ponds will tend to reduce coverage problems and interference with the sanitary sewer system. After development, three exit ponds equipped with small pump stations will be utilized to ensure that flows downstream into Kimball Creek and Best Slough remain below the current values for all storms.

The distributed detention ponds also allow for water quality issues to be addressed prior to entering the downstream system. In addition, State Route 65 Employment Village may utilize streetscapes, bioswales or vegetated swales along some of the streets, parks, parking lots and parkways. Figure 4-4 shows an example of such a swale. These could address water quality issues upstream even before entering the storm drain system. Since this study is aimed primarily at runoff quantities, the storage capacities of the potential bioswales has not been included in this analysis Any use of bioswales will contribute a very small amount of storage in comparison to the detention ponds. Still, this concept represents a possible water quality feature and an added safety buffer for the system.

Figure 4-4, Typical Bioswale

The streetscapes and swales described above represent the first line of pretreatment of runoff. The concept is capable of meeting the Goal HS3 of the Yuba County General Plan Update to slow down, filter and infiltrate storm water. Once storm water enters the underground storm drain system, the second round of pretreatment will occur in the ponds themselves. Figure 4-5 shows the conceptual layout of the typical detention pond which could be utilized at State Route 65 Employment Village.

Such ponds could contribute significantly to groundwater infiltration, sediment settling and filtering of contaminants. The detention ponds envisioned for State Route 65 Employment Village are of the type usually referred to as “Extended Detention Ponds” but with the addition of a forebay to settle out (and clean out) coarse sediments. They will use meandering channels and micropools within the basin to increased detention time and treatment of low flows. The design outlet device, whether via gravity or pump, can ensure that target detention times are achieved. Such a pond also can also realize some of the benefits usually associated with “Infiltration Basins”. The banks and flat portion of bottom will be grass-lined, while the low (wet) areas of the pond will utilize native aquatic plants to promote infiltration and filtering of contaminants. In addition, if the bottom area is large enough, it can have multi-use functions such as for recreational activities. Extended detention basins temporarily detain storm water for an extended period of time, but remain largely dry between storms. Because of the flood prevention sizing of the pond, the potential for downstream flooding and erosion will be eliminated.



Source: Adopted from Pennsylvania Handbook of Best Management Practices for Developing Areas, which adapted the figure from Dam Design and Construction Standards, Fairfax County, Virginia.

Figure 4-5, Typical Extended Detention Basin

As indicated in Figures 4-1, Figure 4-2 and Figure 4-3, the drainage exit points will remain in the same locations as they have historically. Of course how the water gets to the exit points will change with the State Route 65 Employment Village Plan development. The Magnolia Ranch Specific Plan must stand alone if, as expected, it is developed first. Thus the Magnolia Ranch facilities do not depend on any of the ponds and facilities to the west (generally, those west of Bradshaw Road) in the State Route 65 Employment Village Plan. Magnolia runoff will discharge into the existing ditches and creeks which pass through the State Route 65 Employment Village Plan areas to the west. Flows in those ditches and creeks will remain below current levels due to the drainage facilities planned for Magnolia Ranch. The following is a general description of runoff and new ponds, beginning with those serving the Magnolia Ranch Specific Plan area.

The northeast part of the Magnolia project will drain to five "North Ponds" next to Ostrom Road. The five ponds each have restrictive interconnections with adjacent ponds, so that drainage generally moves from east to west through the ponds. The northwest part of the Magnolia project will drain to two "West

Ponds" next to Bradshaw Road. The ponds are planned for each side of the existing wetland area with "West 1" being on the north side and "West 2" being on the south. A large interconnection between the two West Ponds will keep water levels in equilibrium between the two even though the main inflow to the two will be located on the north side of "West Pond 1". The most westward two North Ponds (North 4 and North 5) will have exit structures which control outflow to the trunk line draining to the "West Pond 1". This arrangement greatly decreases peak flows collected at the West Ponds. The primary outflow from the West Ponds will be a small pump located in "West Pond 2" discharging to the historic downstream middle branch of Kimball Creek. During large storms such as the 100-year, "West Pond 2" will also produce a small amount of gravity flow out from a culvert. It is designed so that the culvert is not used for smaller storm events. The pump will have a flow rate of less than the current 10-year storm outflow.

The central part of Magnolia Ranch will drain to "Central Pond" at the west central part of the project. The south part of the project will drain to "South Pond" near the southwest corner of the Magnolia Ranch Specific Plan area. "Central Pond" will have an exit structure which controls outflow draining to "South Pond" via an underground connection. This arrangement greatly decreases peak flows collected at "South Pond". The primary outflow from "South Pond" will be a small pump discharging to the historic downstream south branch of Kimball Creek. During large storms such as the 100-year, "South Pond" will also produce a small amount of gravity flow out from a culvert. "South Pond" will be designed so that the culvert is not used for smaller storm events. The pump will have a flow rate of less than the current 10-year storm outflow.

Moving into the State Route 65 Employment Village Plan west of Bradshaw Road, the northern planned industrial areas along Ostrom Road will drain to "Pond 4" (two interconnected ponds, side by side) near Ostrom Road at North Kimball Creek (west of Virginia Rd.). "Pond 4" will connect to "Pond 3" to the southwest via an underground connection which controls outflow. "Pond 4" has an overflow weir structure which will allow some overflow to Kimball Creek next to the pond in very high storm events. Likewise, "Pond 3" will drain, by gravity to Kimball Creek via a small limiting connection and will also be fitted with an overflow weir structure which will allow some overflow to Kimball Creek next to the pond in high storm events. Still, as will be quantified later in this report, the outflows from Kimball Creek at Rancho Road will be kept well below the current values.

The planned industrial areas between Bradshaw Road and Virginia Road one-fourth to one-half mile south of Ostrom Road will drain to "Pond 2" next to Virginia Road approximately one-half mile south of Ostrom Road. "Pond 2" will connect to "Pond 3" to the west via an underground connection which controls outflow. "Pond 2" has an overflow weir structure which will allow some overflow to Kimball Creek next to the pond in very high storm events. The planned industrial areas west of Virginia Road and one-fourth mile to one mile south of Ostrom Road will drain to "Pond 3", previously described.

The planned industrial and business areas west of Bradshaw Road and one to one and a half miles south of Ostrom Road will drain to “Pond 1” located next to the irrigation canal and just south of the Kimball Creek greenway. Also draining to "Pond 1" will be the Low Density Residential outside Magnolia Ranch and just east of Bradshaw Road. "Pond 1" will connect to "Pond 2" to the northwest via an underground connection which controls outflow. "Pond 1" has an overflow weir structure which will allow some overflow to Kimball Creek next to the pond in very high storm events.

The rural residential region at the extreme west edge of the State Route 65 Employment Village Plan near the intersection of Rancho and Ostrom Roads is envisioned to continue to surface gravity drain to the south via the open ditch along the railroad. The runoff from that area will continue to enter Kimball Creek at its current point next to the railroad just east of Rancho Road.

The above discussion completes all State Route 65 Employment Village Plan areas that drain to Kimball Creek. Moving to the south portion of the State Route 65 Employment Village Plan, drainage will continue to utilize two routes to Best Slough. The area of Low Density Residential and Very Low Density Estates to the south of the Magnolia Ranch area (west of Bradshaw Rd.) will drain south via the existing ditch south of Bradshaw Road to “Pond 6”. "Pond 6" will be located at the extreme south edge of the State Route 65 Employment Village Plan area. "Ponds 6" will gravity drain through the existing culvert under the railroad out of the study area and then southward to Best Slough following the current drainage route. The restrictive outlet from Pond 6 will keep the outflow values below the current levels.

Also in the south part of the State Route 65 Employment Village Plan, but west of Bradshaw Road are planned industrial, commercial and business areas straddling the planned future alignment of South Beale Rd. Those areas will drain to “Pond 5” at the west edge of the study area near Rancho Road. This pond will be at the current location of the outflow to the west to a branch of Best Slough. In order to provide pipe coverage, the bottom of "Pond 5" must be below the flow line of the outflow ditch to the west. As a result, a nuisance pump must be utilized at "Pond 5", discharging to the branch of Best Slough. Pond 5 will also be equipped with two gravity discharge features; a small culvert at the flow line elevation of the downstream ditch and an overflow weir structure which will allow some overflow to Best Slough in very high storm events. The size of "Pond 5" in combination with the outlet structure and nuisance pump, insure that future flows to Best Slough will remain below the current values.

Improvements for the State Route 65 Employment Village Plan area fall into the following general categories:

1. Construction of conveyance system capable of handling a ten (10) year storm. The system will use traditional underground storm drains, but may also connect the water quality swales and other features as conceptualized in Goal HS3 of the Yuba County General Plan;

2. Construction of an underground trunk line capable of handling a twenty-five (25) year storm. The trunk line will vary in size as required to serve the entire area. Only the trunk line system is shown on the storm drainage exhibit. No offsite inflows to the State Route 65 Employment Village trunk lines are anticipated at this time. The north branch of Kimball Creek, which flows into the study area at Ostrom Road just west of Virginia Road will continue to use the current creek bed across the study area and out at the west near Rancho Road;

3. Construction of five detention ponds, "North Ponds". These ponds will be long and narrow next to Ostrom Road in the Magnolia Ranch Specific Plan area. The east and north area of State Route 65 Employment Village will drain to these ponds. The preliminary design calls for excavating to a bottom elevation of 71 feet (North Ponds 1 and 2), 68 feet (North Pond 3), 66 feet (North Pond 4), 65 feet (North Pond 5), a rim elevation of 84 feet (North Ponds 1 and 2), 81 feet (North Pond 3), 78 feet (North Pond 4), 77 feet (North Pond 5), for a total volume of 71.5 acre-feet and a total surface area of 9.63 acres; (Unless otherwise noted, all elevations in this study are referenced to the NGVD 1929 datum)

4. Restrictive interconnections between the first four North Ponds. These pipes will be at the bottom of the ponds, sized so that the volume of the upstream pond is optimally utilized in each case. Under the preliminary design, the connection from North Pond 1 to North Pond 2 is 60-inch diameter; North Pond 2 to North Pond 3 is 36-inch diameter; and North Pond 3 to North Pond 4 is 36-inch diameter;

5. Outflow structures at North Ponds 4 and 5 to regulate flow out to the downstream storm drain system and to ensure that the peak water surface levels in both ponds remain safely below the rim, even under the 100-year scenario. The preliminary design for both North Pond 4 and North Pond 5 calls for two culverts each out to the nearby storm drain system manhole. In the case of North Pond 4, the two culverts would be 12-inch at an invert of 66 feet and a 42-inch at an invert elevation of 73 feet. In the case of North Pond 5, the two culverts would be 12-inch at an invert of 65 feet and a 24-inch at an invert elevation of 73 feet. Both culverts from North Pond 5 must be equipped with flap gates to prevent flow from the manhole back to North Pond 5;

6. A connection pipe between the manhole at the North Pond outlet structures and the northwest trunk line which delivers runoff to West Ponds, also in the Magnolia Ranch area. The preliminary design calls for this line to be 885 feet in length with a diameter of 48-inches;

7. Construction of two detention ponds, "West Ponds". These ponds will cover the low area next to the north end of Bradshaw Road on each side of the small pond that currently exists at the location. West 1 will be on the north side of the existing pond; West 2 will be on the south side. The two ponds will behave essentially as one because a large interconnection will be provided between them. The preliminary design of the interconnection calls for double 60-inch culverts with inverts at 64 feet. The northwest area of Magnolia Ranch will drain to these ponds, as will the outflow from the North Ponds. The preliminary design of West Pond 1 calls for excavating to a bottom elevation of 72 feet, a surface area of 4.25 acres at the rim elevation of 78 feet, but with a low flow channel provided to a depth of 64 feet. The total volume of West Pond 1 at the rim would be 24 acre-feet. The preliminary design of West Pond 2 calls for excavating to a bottom elevation of 63 feet, a total surface area of 7.01 acres at the rim elevation of 78 feet, for a volume of 88 acre-feet;

8. An outflow structure at West Pond 2 to regulate flow out of the pond. The structure will be designed to assure that limited peak flows are delivered downstream out of the project and that the peak water surface levels in both West Ponds remain safely below the rim, even under the 100-year scenario. The preliminary design calls for one 12-inch culvert with an invert of 73 feet and an emergency overflow weir with a lip elevation of 76.5 feet. The culvert will not be utilized during smaller storm events, and the weir will not be used even in a 100-year event. The location and configuration of the outfall is envisioned to discharge into the pond that currently exists between the two planned ponds. This will insure that the existing pond stays wet most of the year, just as it does currently;

9. Construction of a small pump station at the West Pond 2 to ensure that the storm drain system connected to the pond will remain dry except during storms. The pump will activate when the pond begins to fill and will lift water into the existing pond which feeds the nearby middle branch of Kimball Creek. The preliminary design calls for a pump with a nominal capacity of 4 CFS, which is well below the current runoff during the 10-year storm event. The main reason for the pump station is because the invert elevation of Kimball Creek is not low enough to allow gravity flow from an underground storm drain system in the Magnolia Ranch Specific Plan area. The pump station will allow the detention pond to be constructed below the invert of the creek. The pump outlet is envisioned to discharge into the pond that currently exists between the two planned ponds. Discharge from there to the west will be as it is now, via the culvert under Bradshaw Road;

10. Construction of a detention pond, "Central Pond". This pond will be near the central west border of the Magnolia Ranch project area next to the park and provide a year-round pond-lake

amenity. The central area of Magnolia Ranch will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 69 feet, a low flow channel to a depth of 67 feet, and a surface area of 4.2 acres at the rim elevation of 80 feet for a total volume of 39.5 acre-feet;

11. A restrictive outflow conduit from Central Pond to regulate flow out of the pond, maintain the year-round pond-lake amenity at Central Pond and connect to the storm drain system for South Pond, also in the Magnolia Ranch area. The structure and connection will be designed to assure that limited peak flows are delivered to the South Pond system and that the peak water surface levels in Central Pond remain safely below the rim, even under the 100-year scenario. The preliminary design calls for a 36-inch pipeline with an invert of 67 feet. The line will be 908 feet long, with an exit at a manhole in the street south of Central Pond;

12. Construction of a detention pond, "South Pond". This pond will be an elongated pond near the southwest border of the Magnolia Ranch project area. The pond is currently envisioned to provide a year-round pond-lake amenity. A low flow channel or underground pipes around much of the border convey flows from the east end to the pump station at the pond's west end. The south area of Magnolia Ranch will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 67 feet, a low flow channel to the 65 foot elevation and a surface area of 13.2 acres at the rim elevation of 79 feet. The total volume of South Pond at the rim would be 124.0 acre-feet;

13. An outflow structure at South Pond to regulate flow out of the pond. The structure will be designed to assure that limited peak flows are delivered downstream out of the project and that the peak water surface levels in South Pond remain safely below the rim, even under the 100-year scenario. The pond-lake amenity will allow some water to spill once a certain elevation is reached and will be considered backup during power outages. The preliminary design calls for one 12-inch culvert with an invert of 74 feet, and an emergency weir with a lip elevation of 77.5 feet. The culvert will not be utilized during smaller storm events, and the weir will not be used even during the 100-year storm;

14. Construction of a small pump station at the South Pond which will activate when the pond level rises above the normal pond-lake surface. The pump will lift water into the adjacent south branch of Kimball Creek. The preliminary design calls for a pump with a nominal capacity of 4 CFS, which is well below the current runoff during the 10-year storm event. The primary reason for the pump station is because the invert elevation of Kimball Creek is not low enough to allow gravity flow from an underground storm drain system in Magnolia Ranch. The pump station will allow the detention pond to be constructed below the invert of the creek;

15. Construction of a detention pond, “Pond 1”. This pond will be next to the south branch of Kimball Creek approximately one-half mile west of Bradshaw Road in the State Route 65 Employment Village Plan area next to the irrigation canal. The central area of State Route 65 Employment Village Plan area will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 62 feet with a surface area of approximately 8 acres at the rim elevation of 74 feet for a total volume of approximately 76 acre-feet;

16. A restrictive outflow structure at Pond 1. The structure and connection will be designed to assure that limited peak flows are delivered to Pond 2 and locally to Kimball Creek and that the peak water surface levels in Pond 1 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for a 48-inch pipeline with an invert of 62 feet at Pond 1. The line will be approximately 3600 feet long. The emergency weir between Pond 1 and Kimball Creek will have a lip elevation of 72 feet;

17. Construction of a detention pond, “Pond 2”. This pond will be next to Virginia Road between the middle and south branches of Kimball Creek. The central area of State Route 65 Employment Village Plan area just west of Virginia Road will drain to this pond. Pond 2 also collects outflow from Pond 1. The preliminary design calls for excavating to a bottom elevation of 58 feet with a surface area of approximately 8 acres at the rim elevation of 71 feet for a total volume of approximately 83 acre-feet;

18. A restrictive outflow structure at Pond 2. The structure and connection will be designed to assure that limited peak flows are delivered to Pond 3 and locally to Kimball Creek and that the peak water surface levels in Pond 2 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for a 48-inch pipeline with an invert of 58 feet at Pond 2. The line will be approximately 4100 feet long. The emergency weir between Pond 2 and Kimball Creek will have a lip elevation of 69 feet;

19. Construction of a detention pond, “Pond 3”. This pond will be near the west side of State Route 65 Employment Village Plan area in the open space/storm drainage area at the exit point of Kimball Creek. It is just east of Rancho Road. The central-western area of State Route 65 Employment Village Plan area will drain to this pond. Pond 3 also collects outflow from Pond 2 and Pond 4. The preliminary design calls for excavating to a bottom elevation of 54 feet with a surface area of approximately 17 acres at the rim elevation of 64 feet for a total volume of approximately 141 acre-feet;

20. A restrictive outflow structure at Pond 3. The structure will be designed to assure that limited peak flows are delivered to locally to Kimball Creek and that the peak water surface levels in

Pond 3 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for a 24-inch exit culvert with an invert of 54 feet. The emergency weir between Pond 3 and Kimball Creek will have a lip elevation of 61.5 feet;

21. Construction of a detention pond, “Pond 4”. This pond will be next to Ostrom Road just west of Virginia Road next to the north branch of Kimball Creek. It is envisioned as two interconnected ponds side by side. The northwest area State Route 65 Employment Village Plan area west of Bradshaw Road will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 56 feet with a surface area of approximately 9 acres at the rim elevation of 64 feet for a total volume of approximately 62 acre-feet;

22. A restrictive outflow structure at Pond 4. The structure and connection will be designed to assure that limited peak flows are delivered to Pond 3 and locally to Kimball Creek and that the peak water surface levels in Pond 4 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for a 60-inch pipeline with an invert of 56 feet at Pond 4. The line will be approximately 4600 feet long. The emergency weir between Pond 4 and Kimball Creek will have a lip elevation of 62.5 feet;

23. Construction of a detention pond, “Pond 5”. This pond will be near the southwest side of State Route 65 Employment Village Plan area in the open space/storm drainage area at the exit point of a minor branch of Best Slough. It is just east of Rancho Road next to the planned realignment of South Beale Road. The southwest area of State Route 65 Employment Village Plan will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 60 feet and a surface area of approximately 9 acres at the rim elevation of 75 feet. The total volume of Pond 5 at the rim would be approximately 99 acre-feet;

24. An outflow structure at Pond 5 to regulate flow out of the pond into the branch of Best Slough. The structure will be designed to assure that limited peak flows are delivered downstream out of the project and that the peak water surface levels in Pond 5 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for one 15-inch culvert with an invert of 70 feet, and an emergency weir with a lip elevation of 72.8 feet;

25. Construction of a small pump station at the Pond 5 which will activate when the pond level begins to rise. The pump will lift water into the adjacent branch of Best Slough. The preliminary design calls for a pump with a nominal capacity of 5 CFS, which is well below the current runoff during the 10-year storm event. The primary reason for the pump station is because the invert elevation of Best Slough ditch is not low enough to allow gravity flow from an underground storm drain system in this area of the State Route 65 Employment Village Plan

area. The pump station will allow the detention pond to be constructed below the invert of the outflow ditch;

26. Construction of a detention pond, "Pond 6". This pond will at the extreme south edge of the State Route 65 Employment Village Plan area at the exit ditch which delivers storm water southward to Best Slough. The southern region of the State Route 65 Employment Village Plan area will drain to this pond. The preliminary design calls for excavating to a bottom elevation of 71.4 feet with a surface area of approximately 4 acres at the rim elevation of 76 feet for a total volume of approximately 15 acre-feet;

27. A restrictive outflow structure at Pond 6. The structure will be designed to assure that limited peak flows are delivered to locally to Best Slough and that the peak water surface levels in Pond 6 remain safely below the rim, even under the 100-year scenario. The preliminary design calls for using a 36-inch exit culvert with an invert o 71.4 feet, the same as the current culvert under the railroad at that location. The emergency weir between Pond 6 and Best Slough will have a lip elevation of 75 feet;

28. Pad elevations for the State Route 65 Employment Village Plan shall be set at least one foot above the 100-year water surface calculated at the most immediate pond serving each location.

The following tabulation, Table 4-1, summarizes the principal features of the proposed work to be included in the State Route 65 Employment Village Plan.

TABLE 4-1
Principal Features of the Proposed Work

FEATURE	DESCRIPTION OF IMPROVEMENT
Storm Water Conveyance System	A. Provide a conveyance system capable of handling a ten (10) year storm. The system includes drain inlets, the underground collector drains and any surface conveyance by water quality swales. B. Provide an underground collector (trunk) conveyance system of pipelines and manholes capable of handling a twenty-five (25) year storm.

Detention Ponds	A. Provide fifteen new detention ponds, in ten areas each serving a major region of the study area. B. Provide a total of approximately eight hundred four (804) acre-feet of storage. C. Provide 3:1 side slopes and a fifteen (15) foot operation and maintenance road around the perimeter of each pond. D. Provide entirely grass-lined surfaces to aid infiltration and in some cases to accommodate recreational activities. E. Provide an emergency overflow weir at each pond for storms larger than the 100-year, and for the case where a pump fails. F. All references to elevations in this report are based on the NGVD 29 datum.
Detention Pond Outlet Structures	A. Provide outlet structures with sized culvert at North Pond 4 and Pond 3 to optimize flood control and water quality. B. Provide outlet structures with sized exit culvert at North Pond 5, West Pond 2, South Pond, Pond 5 and Pond 6 to optimize flood control and water quality. Culverts must utilize back-flow preventers.
Detention Pond Interconnections	A. Provide an underground sixty (60) inch pipeline from North Pond 1 to North Pond 2, designed to operate in all storm events. B. Provide an underground thirty-six (36) inch pipeline from North Pond 2 to North Pond 3, designed to operate in all storm events. C. Provide an underground thirty-six (36) inch pipeline from North Pond 3 to North Pond 4, designed to operate in all storm events. D. Provide underground double sixty (60) inch culverts under the existing wetland between West Pond 1 and West Pond 2. E. Provide an underground forty-eight (48) inch pipeline from the manhole collecting outflow from North Pond 4 and North Pond 5 to the main northwest storm drain trunk line, designed to operate in all storm events. F. Provide an underground thirty-six (36) inch pipeline from the outlet structure of Central Pond to the trunk line for South Pond, designed to operate in all storm events. G. Provide an underground forty-eight (48) inch pipeline from the outlet structure of Pond 1 to Pond 2, designed to operate in all storm events. H. Provide an underground forty-eight (48) inch pipeline from the outlet structure of Pond 2 to Pond 3, designed to operate in all storm events. I. Provide an underground sixty (60) inch pipeline from the outlet structure of Pond 4 to Pond 3, designed to operate in all storm events.

Storm Water Pumping Stations	A. Provide a storm water pumping station with a nominal four (4) CFS capacity at West Pond 2 with an outlet pipe to the nearby branch of Kimball Creek. B. Provide a storm water pumping station with a nominal four (4) CFS capacity at South Pond with an outlet pipe to the nearby branch of Kimball Creek. C. Provide a storm water pumping station with a nominal five (5) CFS capacity at Pond 5 with an outlet pipe to the adjacent branch of Best Slough. D. All pumps shall be set to begin operation at a water level which optimizes flood control and water quality. The pump at South Pond will further be designed to operate above the normal pond-lake water surface.
Pad Elevations	A. All pad elevations shall be at least one (1) foot above the one hundred (100) year storm water surface level at the detention pond serving the pad.

4.4 Phasing of Drainage Infrastructure

The facilities design presented in this study represents the final situation with all of the study area developed. Phasing for the drainage facilities has not been detailed at this point except that the Magnolia Ranch Specific Plan area can stand alone without any other development of the State Route 65 Employment Village area. The current assumption is that Magnolia Ranch will develop first. As the remaining part of the State Route 65 Employment Village develops, the most reasonable way for such development to progress is from the west to the east. Pond 3 next to Rancho Road could be completed along with the development of the industrial areas that drain directly to Pond 3. Likewise Pond 5 next to Rancho Road could be completed along with the development of the industrial/commercial/business areas that drain directly to Pond 5, and Pond 6 in the far south could be completed along with the development of the LDR areas that drain directly to Pond 6. In the next tier, Pond 4 and/or Pond 2 could be completed (including their connections to Pond 3) along with the development of the industrial areas that drain directly to each of those ponds. Lastly, Pond 1 could be completed (including its connection to Pond 2) along with the development of the industrial and LDR areas that drain directly to Pond 1.

Other phasing strategies are likely possible, but alternative engineering solutions would need to be considered to support such strategies.

4.5 State Route 65 Employment Village Improvements: Summary Design Criteria

The basis to complete the designs and prepare contract plans for the State Route 65 Employment Village Improvements are summarized below and developed fully with analysis later in this report.

- Pad Elevations

  - Building pad elevations for the State Route 65 Employment Village Plan shall be set at least a foot above the 100-year peak water surface computed for the detention pond which serves any given pad. All references to elevations in this report are based on the NGVD 29 datum.

- Frequency of the design storm events

  - A hydrologic configuration consisting of a twenty-four (24) hour, 100-year storm event falling over the entire watershed for the detention ponds pumping systems, detention pond interconnections and detention pond outlet facilities;
  - A hydrologic configuration consisting of a twenty-four (24) hour, 25-year storm event falling over the entire watershed for the underground trunk conveyance system;
  - A hydrologic configuration consisting of a twenty-four (24) hour, 10-year storm event falling over the entire watershed for the storm water collector conveyance system;
  - All design storms will be based on the conventional hydrographs, which use the Wheatland Gage as their basis.

- Storm Drain Outfall Structures

  - An outfall structure shall be provided at each location where the storm drain trunk lines discharge to the various detention ponds. The structures will incorporate diffusers to eliminate erosion even during the 100-year storm events;
  - An outfall structure shall be provided at each location where a detention pond outlet (pump, culvert or weir) discharges offsite downstream. The structures will incorporate diffusers to eliminate erosion even during the 100-year storm events;
  - The outfall structures must also accommodate any overland runoff during larger storm events, up to and including a 100-year event.

- Detention Ponds

  - Fifteen detention ponds capable of providing a total of approximately 804 acre-feet of storage below elevation 84.0 feet (the highest rim elevation) and above 54 feet (the lowest pond bottom elevation);

  - Ponds shall be equipped with outflow structures designed to limit outflow under all storms and to insure that the pond maintains the required freeboard during the 25-year and 100-year storms;
  - Underground pipeline interconnections will allow outflow from North Ponds to reach West Ponds, Central Pond to reach South Pond, Pond 1 to reach Pond 2, Pond 2 to reach Pond 3, and Pond 4 to reach Pond 3;
  - The detention ponds will have the capability to provide pretreatment of the runoff from the State Route 65 Employment Village Plan through the use of a grass lined bottoms, forebays and/or meandering low flow channels.
  - West Pond 2, South Pond and Pond 5 shall be equipped with pumps and outflow structures designed to limit outflow peak, duration and quantity to levels less than currently exist under all storms and to insure that the ponds maintain the required freeboard during the 25-year and 100-year storms;
  - Provide an emergency overflow weir for all ponds for storms larger than the 100-year, or in case a pump fails;

- Pump Stations

  - The capacity of the pump station at West Pond 2 will be 4.0 CFS nominal;
  - The capacity of the pump station at South Pond will be 4.0 CFS nominal;
  - The capacity of the pump station at Pond 5 will be 5.0 CFS nominal;
  - All pumps and controls shall remain at least one foot above peak water level during the 100-year storm event, even when that level is based on the pumps being non-operational;
  - Complete Operations & Maintenance plans shall be developed and implemented.

- Minimum side slopes of Detention Basins

  - 3H to 1V waterside;
  - 2H to 1V landside.

- Detention Basin Freeboard

  - All basins will retain at least 1 foot of freeboard above the water surface elevation during a 24-hour, 100-year storm event;
  - All basins will retain at least 2 foot of freeboard above the water surface elevation during a 24-hour, 25-year storm event.

- Permanent ramps
    - The maximum grade for the ramps will be 10%. Ramps will be provided at one point of access at each pond.
- Pond maintenance road top width
    - All maintenance roads shall have a minimum top width of 15 feet.

4.6 Operation and Maintenance Assumptions

In order to ensure that these pipelines, detention basins, pump stations, and structures do not become overgrown with trees and shrubs, rendered out of service, or clogged with debris such as tires, and other material, it is imperative that the pipelines, channels, detention basins, pump stations and structures be maintained on a regular basis. If adequate maintenance is not performed, the capacity of the respective pipelines, channels, detention basins and pump stations will be reduced. This reduction in flow carrying capacity can result in a higher backwater within the system and causing flooding to adjacent lands and structures. Each jurisdictional entity needs to implement an ongoing maintenance plan that addresses keeping the drainage facilities in a condition such that the effective flow area will not be restricted and the effective resistance to flow (i.e. Manning's roughness coefficient) will not be increased over the values utilized in the design analysis.

Pump performance tests shall be conducted in place to ensure that pumps perform as specified. Periodic tests during the operational life of the station are appropriate to check continued operating efficiency of the pumping station. Operation and maintenance of pump stations involves frequent inspection, monitoring, and maintenance. It is recommended practice to establish an operation and procedures manual that is to be used after construction of the pump station.

4.7 Hydrology

HEC-1, version 4.1 utilizing the SCS method was used to model rainfall runoff over the entire watershed. The watershed subsheds for State Route 65 Employment Village are shown in Figure 4-6 for current conditions and Figure 4-7 for the developed conditions. The hydrologic parameters for the State Route 65 Employment Village subsheds are summarized in the two tables: Table 4-2 for current conditions, and Table 4-3 for developed conditions. Specifics of the hydrologic parameters are discussed in subsequent sections. Note that the areas covered don’t match exactly. Drainage collection often continues to the center of some surrounding streets and some of the streets will be changed during development. Thus the total drainage area involved is slightly different when Table 4-2 is compared to Table 4-3. The shed naming convention for developed conditions is as follows: Sheds beginning with “N” flow first to one of the North Ponds in Magnolia; sheds beginning with “W” flow to the West Ponds in Magnolia; sheds beginning with “C” flow first to Central Pond in Magnolia; sheds beginning with “S” flow to the South Pond in Magnolia; sheds beginning with “DK” are outside Magnolia but flow to Kimball Creek; sheds beginning with “DB” are outside Magnolia but flow to Best Slough; and sheds beginning with “NK” are outside the study area north of Ostrom and flow to Kimball Creek.

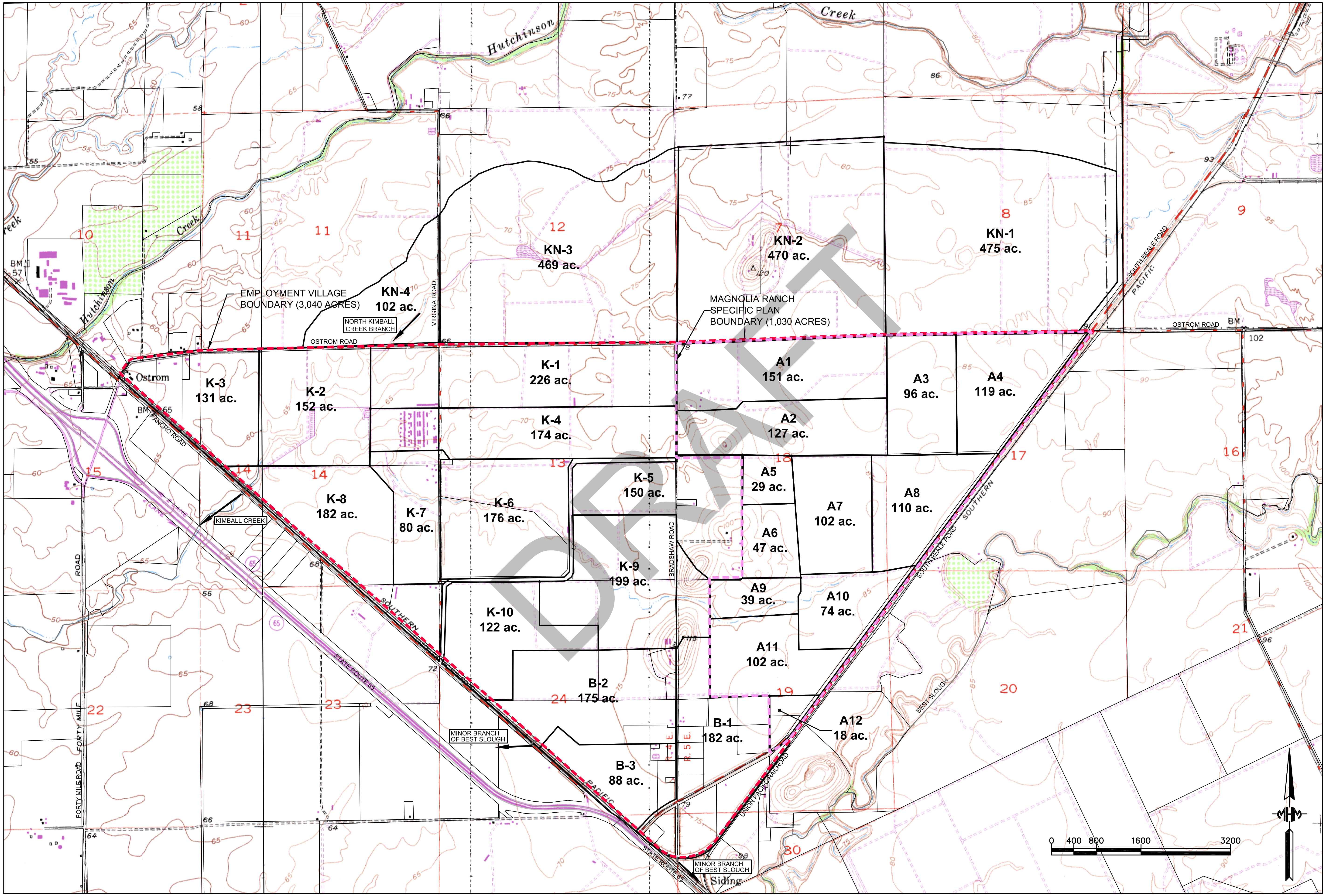
The subsheds in Figure 4-6 follow the drainage patterns dictated by the rice checks and farming operations currently in use. The developed subsheds in Figure 4-7 follow the logical groupings of areas expected to drain via the to-be-designed storm drain collector system to the trunk lines presented in this report. Goal HS3 of the Yuba County General Plan calls for slowing runoff and decreasing impervious surfaces for new development. The goal encourages the use of “Low Impact Development” (LID) and “Natural Drainage System” (NDS) concepts. While State Route 65 Employment Village will be designed consistent with this goal, the parameters used for the preliminary design of the storm drain system utilize more conservative values of the runoff parameters (CN, % Impervious and Lag Time) than could ultimately be realized under Goal HS3. This conservative approach will insure a robust drainage plan.

4.7.1 Storm Frequency and Degree of Protection

The storm frequency and intensities correspond to those used for most studies in southern Yuba County, based on the Wheatland 2NE rain gage. Storms are generally classified by “frequency” or “return period” such a 10-year storm, a 50-year storm, etc. A 10-year storm, for example, is the intensity of storm, which will occur an average of once in every 10-year period, as computed from available data. The greater the “return period,” the greater the intensity of rainfall. The rainfall events were simulated using 10-, 25-, and 100-year frequency storms of 24-hour duration. Wheatland 2NE precipitation totals for those events were 2.87, 3.38 and 4.09 inches respectively. The hydrographs have been computed well past the end of the storms so that runoff and pond levels can be studied as the system returns to normal levels. As an example, the 24-hour storms include hydrograph runoff simulations for 120 hours. Storm precipitation values utilized in the HEC-1 model were subjected to no spatial variability, which conservatively assumes the storm falls over the entire study area simultaneously. The SCS dimensionless unit hydrograph used in this study was based on the standard 24-hour temporal rainfall distribution Type I storm. Type I storms generate higher peak flows, so the use of Type I in this report represents a conservative approach.

4.7.2 Infiltration Rate Characteristics

The amount of infiltration is related to the permeability of the surficial soils, the local geomorphology, and the amount and type of vegetation cover or canopy. Soil Survey maps prepared for the Yuba County Soil Conservation Service (hereinafter referred to as “SCS”) were used to determine the extent of Type A, B, C, and D hydrological soil groups within the watershed. The areas of each respective soil group were then summarized for each watershed and assigned SCS curve numbers corresponding to a Type II antecedent moisture condition (AMCII), representing the average curve number. As an example, Type “A” (relatively pervious) soils are predominantly localized sand and gravel areas, while the Type “D” (relatively impervious) soils are generally poorly drained clays. Most of the soils in the study area have been classified by the SCS as Type D. The soil characteristics are detailed in Tables 4-2 and 4-3.



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Symbol | Description | Date | Approved

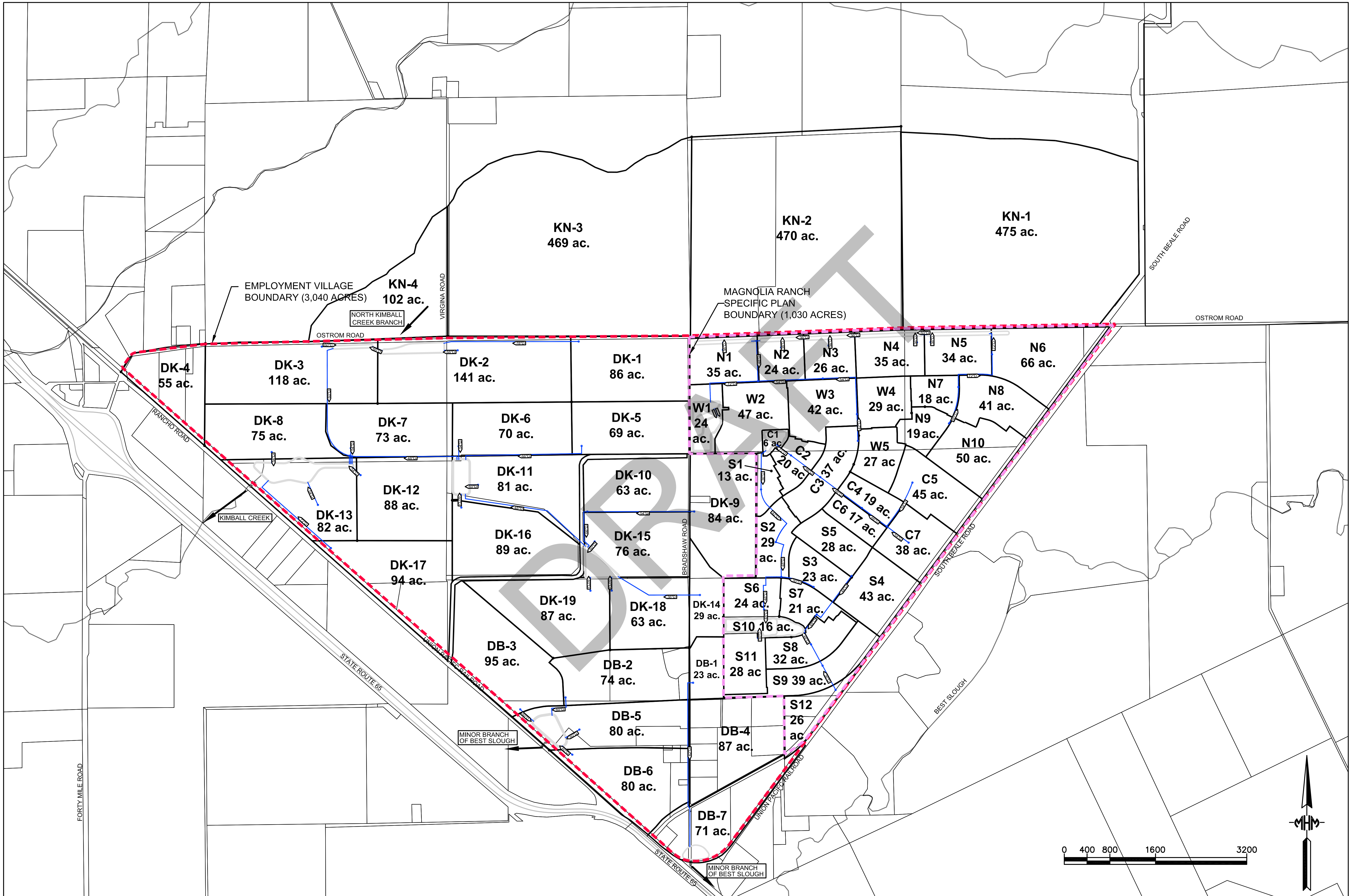
Rev. 100%
Date: 04-30-13
Design file no: 13122
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:
Designed by: MHM INCORPORATED
Dwn by: SMM
Reviewed by: JMS
Submitted by:
Sean M Minard RCE 52593

FIGURE 4-6
CURRENT CONDITION SUBSHEDS

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-6

Dwg.:13-122



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Symbol	Description	Date	Approved

Rev. 100%
Date: 04-30-13
Design file no: 13122
Drawing Code:
File name: 04-30-13
Plot scale:
Designed by: MHM INCORPORATED
Reviewed by: JMS
Dwn by: SMM
Submitted by:
Sean M Minard RCE 52593

FIGURE 4-7
DEVELOPED CONDITION
SUBSHEDS

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing
reference
number
FIGURE 4-7

Dwg.:13-122

TABLE 4-2
State Route 65 Employment Village
Existing Conditions Runoff Parameters

Shed	Area acres	Area sq. mi.	Drainage Description	Main Soil Groups	SCS CN	% Impervious	SCS Lag Hours	100-year Peak Runoff CFS
Kimball Creek Sheds - North of the Study Area								
KN-1	474.6	0.7416	Rice	D	81.0	1	0.1*	673
KN-2	470.0	0.7344	Mostly Rice	D	82.0	2	0.1*	700
KN-3	469.4	0.7334	Rice	D	81.0	2	0.1*	671
KN-4	102.0	0.1594	Pasture	D	84.0	2	1.20	53
Offsite Total:	1516.0							
Magnolia Ranch Sheds								
A1	151.4	0.2366	Mostly Rice	D	81.0	1	0.1*	215
A2	126.8	0.1981	Mostly Rice	D	81.0	1	0.1*	180
A3	95.6	0.1494	Rice	D	81.0	1	0.1*	136
A4	119.2	0.1863	Rice	D	81.0	1	0.1*	169
A5	28.6	0.0447	Rice	D	81.0	1	0.1*	41
A6	47.1	0.0736	Mostly Rice	D	81.0	1	0.1*	61
A7	102.5	0.1602	Rice	D	81.0	1	0.1*	145
A8	109.8	0.1716	Rice	D	81.0	1	0.1*	156
A9	38.7	0.0605	Rice	D	81.0	1	0.1*	55
A10	73.8	0.1153	Rice	D	81.0	1	0.1*	105
A11	101.6	0.1588	Rice	D	81.0	1	0.1*	144
A12**	18.1	0.0283	Rice	D	81.0	1	0.1*	26
Magnolia Total:	1013.2							
Area Sheds Routed to Kimball Creek (areas west of Magnolia Ranch)								
K-1	226.5	0.3538	Rice, Pasture, Row Crops	D	83.2	1	2.80	67
K-2	151.7	0.2370	Rice, Row Crops	D	85.0	1	1.74	65
K-3	131.3	0.2052	Row Crops, Open Field, Rural Res.	D	85.0	3	3.62	36
K-4	174.0	0.2719	Row Crops, Rice Fieds, Feed Lot	D	86.9	2	3.05	57
K-5	149.9	0.2342	Open Fields, Row Crops	D	85.5	2	2.36	54
K-6	175.9	0.2748	Rice, Row Crops	D	84.0	1	2.00	66
K-7	80.2	0.1253	Row Crops, Feed Lots	D	89.0	3	2.00	37
K-8	182.3	0.2848	Row Crops, Open Fields	D	86.0	2	4.58	45
K-9	198.5	0.3102	Row Crops, Feed Lots	D	88.3	5	2.10	87
K-10	121.6	0.1900	Row Crops	D, C	85.7	1	3.25	36
Kimball Total:	1591.9							

TABLE 4-2 continued

Area Sheds Routed to Best Slough**

B-1	181.9	0.2842	Row Crops, Open Field, Rural Res.	D	85.0	5	3.29	54
B-2	175.2	0.2738	Row Crops, Rural Res.	C, D	84.7	2	3.29	50
B-3	87.5	0.1367	Rice, Rural Res.	D, C	80.0	2	.1*	120
Best Total:	444.6							
Highway 65 Area Total	3049.7							
Total with Offsite	4565.7							

*Rainfall directly on rice check ponding - this lag represents contribution to ponding. Downstream lag is determined by HEC-1 model of pond overflow.

**Magnolia shed A12 also routes to Best Slough

TABLE 4-3

State Route 65 Employment Village

Developed Conditions Runoff Parameters

Kimball Creek Sheds - North of the Study Area (No Development)

Shed	Area acres	Area sq. mi.	Drainage Description	Main Soil Groups	SCS CN	% Impervious	SCS Lag Hours	100-year Peak Runoff CFS
KN-1	474.6	0.7416	Rice	D	81.0	1	0.1*	673
KN-2	470.0	0.7344	Mostly Rice	D	82.0	2	0.1*	700
KN-3	469.4	0.7334	Rice	D	81.0	2	0.1*	671
KN-4	102.0	0.1594	Pasture	D	84.0	2	1.20	53
Offsite Total	1516.0							

Magnolia Ranch Sheds

Sub-Basin	Acres	Area sq. mi.	Drainage Description	Main Soil Group	Weighted CN*	%** Impervious	SCS Lag Time, Minutes (60% of Tc) Sheet	Gutter	SD	Total	SCS Lag** Hours	100-year Peak Runoff CFS
N1	35.0	0.0546	LDR, Parkway, Pond	D	86.1	32.8	6.92	3.59	9.23	19.74	0.3290	45
N2	23.6	0.0369	LDR, Pond, Park	D	86.6	30.8	7.28	3.59	9.23	20.10	0.3350	30
N3	26.1	0.0408	LDR, Pond, Park	D	86.6	30.8	7.28	3.59	9.23	20.10	0.3350	33
N4	35.2	0.0550	LDR, Pond, Park	D	86.7	31.3	6.88	3.59	9.23	19.70	0.3283	46
N5	34.2	0.0534	LDR, Pond, Park	D	86.7	31.3	6.90	3.59	9.23	19.72	0.3287	44
N6	66.1	0.1033	Business Park	D	91.0	60.0	5.23	3.59	12.43	21.25	0.3542	96
N7	18.0	0.0281	LDR	D	86.0	35.0	6.91	3.59	9.23	19.73	0.3288	23
N8	41.2	0.0643	LDR	D	86.0	35.0	6.92	3.59	11.03	21.54	0.3590	51
N9	19.3	0.0301	LDR, Park	D	84.0	25.0	14.56	3.59	9.23	27.38	0.4563	19
N10	50.3	0.0787	LDR, Park	D	85.3	31.3	14.56	3.59	11.03	29.18	0.4863	52
W1	23.6	0.0369	Pond, MPOS, Fire, Commercial	D	91.5	14.6	5.00	2.00	2.00	9.00	0.1500	44
W2	46.7	0.0729	LDR/VLDR	D	85.3	33.6	6.93	3.59	10.71	21.23	0.3538	57
W3	41.6	0.0651	LDR/School	D	87.4	40.4	12.94	3.59	9.23	25.76	0.4293	50
W4	28.9	0.0451	LDR	D	86.0	35.0	6.91	3.59	9.23	19.73	0.3288	37
W5	26.7	0.0418	LDR	D	86.0	35.0	6.91	3.59	9.18	19.68	0.3280	35
C1	5.7	0.0089	Pond, Park	D	93.3	2.3	5.00	0.00	0.00	5.00	0.0833	13
C2	20.1	0.0313	LDR, Park	D	84.8	29.0	6.93	3.59	9.18	19.70	0.3283	25
C3	37.4	0.0585	LDR, Park, School	D	86.6	36.6	12.94	3.59	10.11	26.64	0.4440	43
C4	18.6	0.0290	Park	D	80.0	5.0	21.86	0.00	0.00	21.86	0.3643	16
C5	44.6	0.0697	LDR, MDR	D	86.7	36.7	6.29	3.59	9.23	19.99	0.3332	58
C6	16.8	0.0263	MDR	D	88.0	40.0	5.92	3.59	6.42	15.93	0.2655	26
C7	38.4	0.0600	Commercial, HDR	D	92.9	71.9	10.64	2.25	6.42	19.31	0.3218	61

TABLE 4-3 continued

S1	13.5	0.0211	LDR	D	86.0	35.0	6.91	3.59	4.00	14.50	0.2417	20
S2	28.6	0.0447	LDR	D	86.0	35.0	6.91	3.59	9.76	20.26	0.3377	37
S3	23.0	0.0360	LDR	D	86.0	35.0	6.91	3.59	9.23	19.73	0.3288	30
S4	43.4	0.0678	LDR, MDR, Park	D	85.6	32.0	14.56	3.59	9.23	27.38	0.4563	47
S5	28.4	0.0443	LDR	D	86.0	35.0	6.91	3.59	9.23	19.73	0.3288	37
S6	24.4	0.0381	LDR	D	86.0	35.0	6.91	3.59	8.72	19.22	0.3203	32
S7	21.4	0.0334	LDR/Clubhouse	D	86.0	35.0	6.91	3.59	8.72	19.22	0.3203	28
S8	31.9	0.0499	LDR/Park	D	85.1	30.3	6.91	3.59	10.11	20.61	0.3435	39
S9	38.6	0.0603	LDR	D	86.0	35.0	6.91	3.59	9.88	20.38	0.3397	49
S10	15.9	0.0248	Pond, Park	D	95.0	2.0	5.00	0.00	0.00	5.00	0.0833	36
S11	28.0	0.0438	LDR	D	86.0	35.0	6.91	3.59	11.04	21.54	0.3590	35
S12	26.0	0.0407	VLDR, Park	D	83.8	26.3	7.56	3.59	9.15	20.30	0.3383	30
Magnolia Total:	1021.0											

Area Sheds Routed to Kimball Creek (areas west of Magnolia Ranch)

DK-1	85.5	0.1336	Indoor Industrial	D	93	72	2.76	4.49	10.00	17.25	0.2875	143
DK-2	141.0	0.2203	Outdoor Industrial	D	91	50	6.77	4.49	12.00	23.26	0.3877	194
DK-3	118.5	0.1851	Outdoor Industrial	D	91	50	6.77	4.49	12.00	23.26	0.3877	163
DK-4	54.8	0.0856	Rural Residential	D	85	5	128.47	n/a	n/a	128.47	2.1412	21
DK-5	68.7	0.1073	Indoor Industrial	D	93	72	2.76	4.49	10.00	17.25	0.2875	114
DK-6	69.8	0.1091	Outdoor Industrial	D	91	50	6.77	4.49	10.00	21.26	0.3543	100
DK-7	72.8	0.1138	Outdoor Industrial	D	91	50	6.77	4.49	10.00	21.26	0.3543	104
DK-8	75.1	0.1173	Outdoor Industrial	D	91	50	6.77	4.49	10.00	21.26	0.3543	107
DK-9	84.4	0.1319	LDR	D	86	35	3.72	3.59	15.00	22.31	0.3718	104
DK-10	62.7	0.0980	Indoor Industrial	D	93	72	2.76	4.49	10.00	17.25	0.2875	105
DK-11	81.4	0.1272	Outdoor Industrial	D	91	50	6.77	4.49	10.00	21.26	0.3543	116
DK-12	88.1	0.1377	Outdoor Industrial	D	91	50	6.77	4.49	10.00	21.26	0.3543	126
DK-13	82.3	0.1286	Outdoor Industrial, Open Space/Pond	D	87.5	26	6.77	4.49	10.00	21.26	0.3543	104
DK-14	29.4	0.0459	LDR	D	86	35	2.90	3.59	5.00	11.49	0.1915	48
DK-15	75.8	0.1184	Indoor Industrial, Open Space/Pond	D	92.4	67	2.76	4.49	10.00	17.25	0.2875	125
DK-16	88.7	0.1386	Outdoor Industrial	D	91	50	6.77	4.49	12.00	23.26	0.3877	122
DK-17	93.8	0.1466	Outdoor Industrial	D	91	50	6.77	4.49	12.00	23.26	0.3877	129
DK-18	63.1	0.0986	Indoor Industrial	D	93	72	2.76	3.59	10.00	16.35	0.2725	107
DK-19	86.7	0.1355	Business Park	D, C	90	60	5.23	3.59	12.00	20.82	0.3470	126
Kimball Total:	1522.5											

TABLE 4-3 continued

Area Sheds Routed to Best Slough

DB-1	23.1	0.0361	LDR	D	86	35	2.90	3.59	5.00	11.49	0.1915	38
DB-2	74.2	0.1159	Business Park; Indoor Industrial	D, C	91.5	68	2.76	4.49	11.00	18.25	0.3042	119
DB-3	94.5	0.1477	Business Park	C, D	90	60	6.77	4.49	12.00	23.26	0.3877	131
DB-4	87.1	0.1361	VLDR/Estates	D	85	5	94.7	n/a	n/a	94.7	1.5783	40
DB-5	79.9	0.1249	Highway Commercial; Pond/Open Space	D, C	92	69	4.59	3.59	12.00	20.18	0.3363	121
DB-6	79.9	0.1248	Highway Commercial	D, C	95	85	4.46	3.59	15.00	23.05	0.3842	119
DB-7	70.9	0.1107	VLDR/Estates	D	85	5	103.1	n/a	n/a	103.1	1.7183	31
Best Total:	509.5											
Highway 65 Area Total	3053.0											
Total with Offsite	4569.0											

*Rainfall directly on rice check ponding - this lag represents contribution to ponding. Downstream lag is determined by HEC-1 model of pond overflow.

**The Yuba County General Plan Update under Goal HS3 calls for slowing runoff and decreasing impervious surfaces for new development. While Magnolia Ranch will be designed consistent with this goal, the parameters used for design of the storm drain system utilize conservative values of CN, % Impervious and Lag Time. This conservative approach will insure a robust drainage plan.

4.7.3 Runoff Potential – Curve Numbers and SCS Lag Time

Runoff potential is directly related to land use, and this study has analyzed both existing and the proposed land use in the State Route 65 Employment Village Plan. Land use is important in determining storm runoff to the extent that it changes the natural characteristics of the ground surface. Increased development results in less infiltration and surface storage, thus increasing the volume of runoff. Also increasing the amount of impervious areas results in faster times of concentration, therefore increasing the peak flows. For existing land use, the runoff potential was based on analysis of existing studies, aerial photographs, and application of standard assumptions for such land use. The HEC-1 models used model runoff potential by specified “SCS Curve Numbers” or “CN”. The pre-development condition under farming, resulting in CN values between 80 and 89. The developed CN varied widely depending on the land use, and the percentage of the drainage basin actually developed. The highest values used were for the areas of concentrated business and commercial use and the lowest values were for parks and open space. The developed drainage basins used area-weighted CN values ranging between 80 and 95. The details are shown in Tables 4-2 and 4-3.

As discussed State Route 65 Employment Village Plan area is currently predominantly in farm lands. The modeling approach used for the rice fields in this study for the “pre-development” models was to treat a large proportion of the existing fields as ponds which will overflow once a 4-inch depth is reached. The models also utilize some typical small low-level culvert outflow from the ponded fields. Thus, in the HEC-1 model, numerous storage nodes are included. The areas of storage were estimated from aerial photographs. Values of ponding areas ranging from 69% to 95% were used in the HEC-1 model for the sheds that show significant coverage by rice fields. Generally, smaller areas and smaller checks have a larger portion of the total area consumed by boundary roads and thus not available to provide ponding. The net effect of the agricultural ponding is to greatly reduce and delay the pre-development peak flow predictions. This in turn puts a more stringent requirement on the detention ponds in the State Route 65 Employment Village area design so that outflows are not increased due to development. Agricultural ponding was not used for areas currently under farming operations other than rice.

Time of concentration assumptions used were developed based on analysis of land use and application of standard assumptions for such land use as used in the computer model. The time of concentration is the time required for water to travel from the most remote (by time) point of the drainage area to the point at which all runoff from this area first concentrates. The maximum runoff for a given drainage area occurs at this time of concentration. Since the HEC-1 analysis models used the SCS method, an SCS lag time was used rather than time of concentration. As per usual engineering standards, the SCS lag time was assumed to be 60% of the time of concentration. The values used for pre- and post-development conditions for the various drainage subsheds can be found in Tables 4-2 and 4-3. The short values for rice fields in Table 4-2 (and in Table 4-3 for the undeveloped area north of Ostrom Road) reflect the reality that rainfall falling in rice fields begins to be stored nearly immediately; the storm water does not have to travel any distance to begin to contribute to agricultural ponding. The time delays associated with the current condition HEC-1 model are related to the time it takes to flood fields, then produce outflow, not to the SCS lag time.

Under developed conditions (Table 4-3), the lag times represent the full process involving rainfall landing on a lot, traveling to a street gutter, traveling a distance in the gutter before entering the storm drain or swale conveyance, and finally traveling in the storm drain/swale to the point that it enters the main trunk line. The time of concentration for that process for a typical residential subshed might be around 30 to 40 minutes, resulting in a typical lag time of 0.3 to 0.4 hours (with the 60% factor). The hydrologic modeling for both current and future conditions utilized HEC-1 simulations.

4.7.4 Runoff Hydrographs – Peak Flows

The individual subshed runoff hydrographs are of limited use in this study. In the current condition models they represent rainfall directly reaching rice checks. However, for reference the peak flow for each subshed under the 100-year 24-hour storm is indicated in Table 4-2. Of greater interest and discussed later in this report is the resulting runoff from the study area to Kimball Creek or Best Slough downstream. For the developed conditions the runoff represents the predicted runoff the main storm drain trunk lines will receive from the various developed subsheds. These hydrographs are in turn used to size the trunk lines, the pumps and the detention ponds. That work is discussed later in this report, but the peak outflows from the developed subsheds are listed in Table 4-3 for the 100-year 24-hour storm simulation.

Screen shots of the HEC-1 models for current and developed conditions are shown in Figures 4-8a, b and 4-9a, b. For each case, there is a model for all sheds that flow eventually to Kimball Creek and a separate model for all sheds that flow eventually to Best Slough. The screen shots are are useful in understanding the HEC-1 because they show all subshed inflows, nodes, ponds and routing for both the pre-development (current conditions) case and the post-development case.

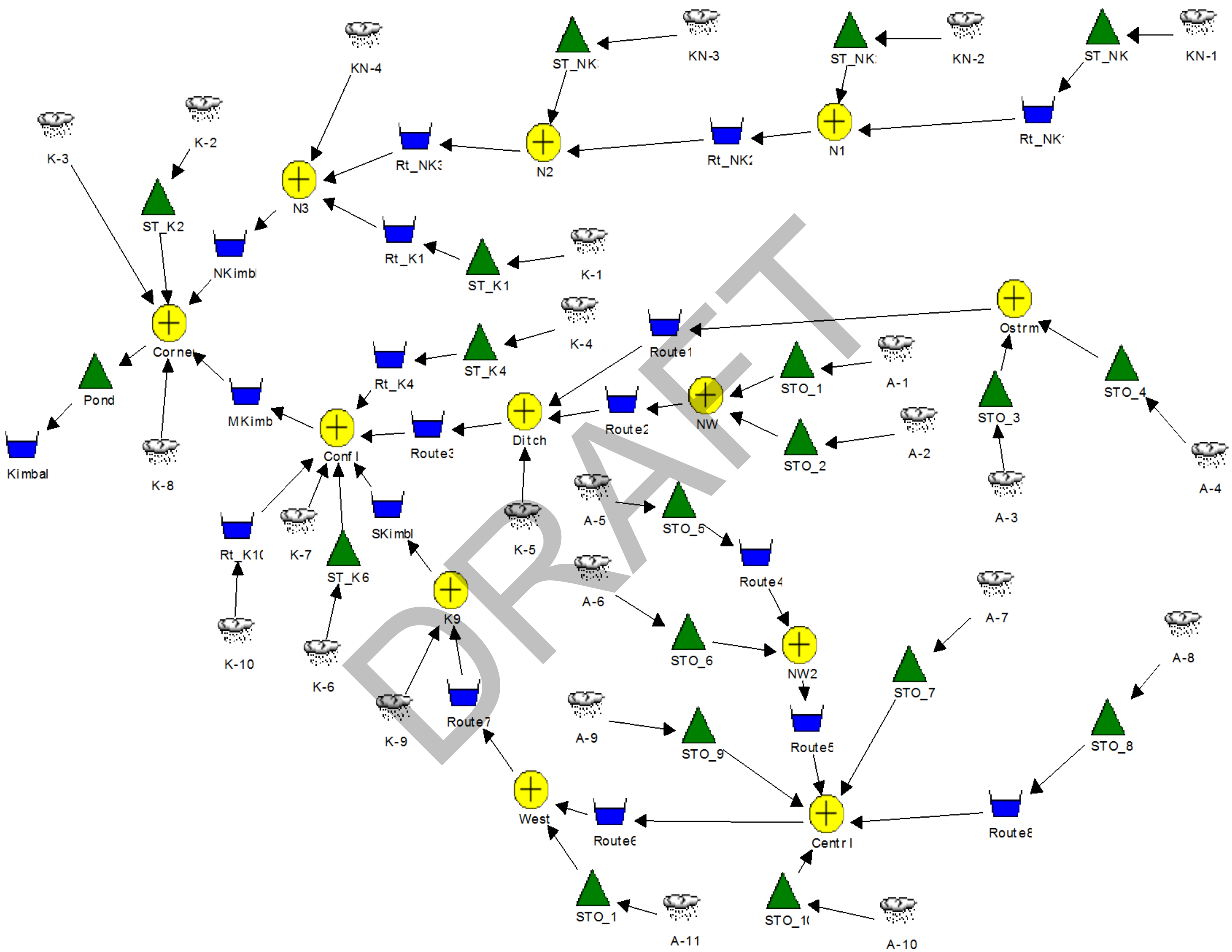


Figure 4-8a

State Route 65 Employment Village HEC-1 Model under Current Conditions

Main Region for Sheds Draining to Kimball Creek

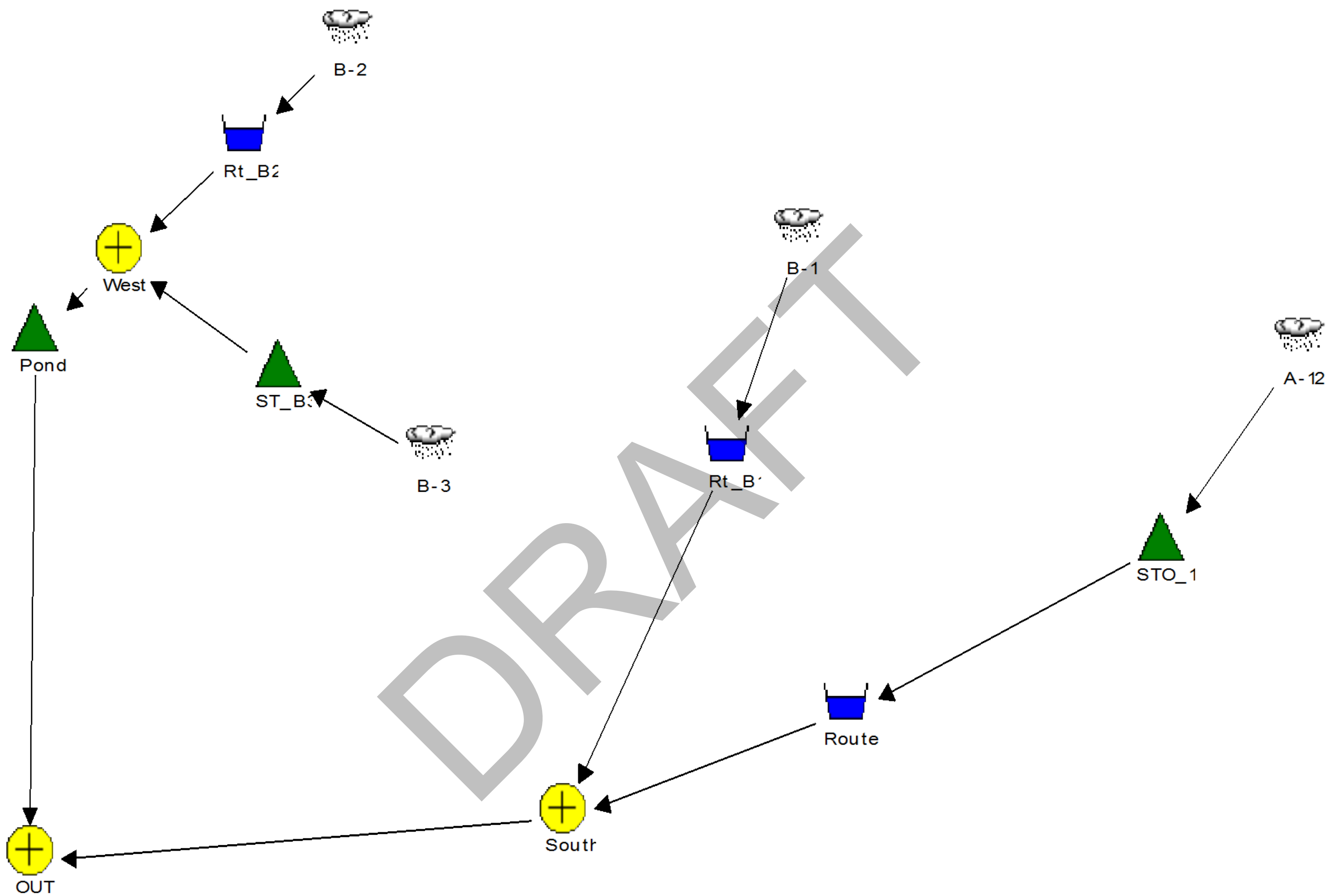


Figure 4-8b

State Route 65 Employment Village HEC-1 Model under Current Conditions

South Region for Sheds Draining to Best Slough

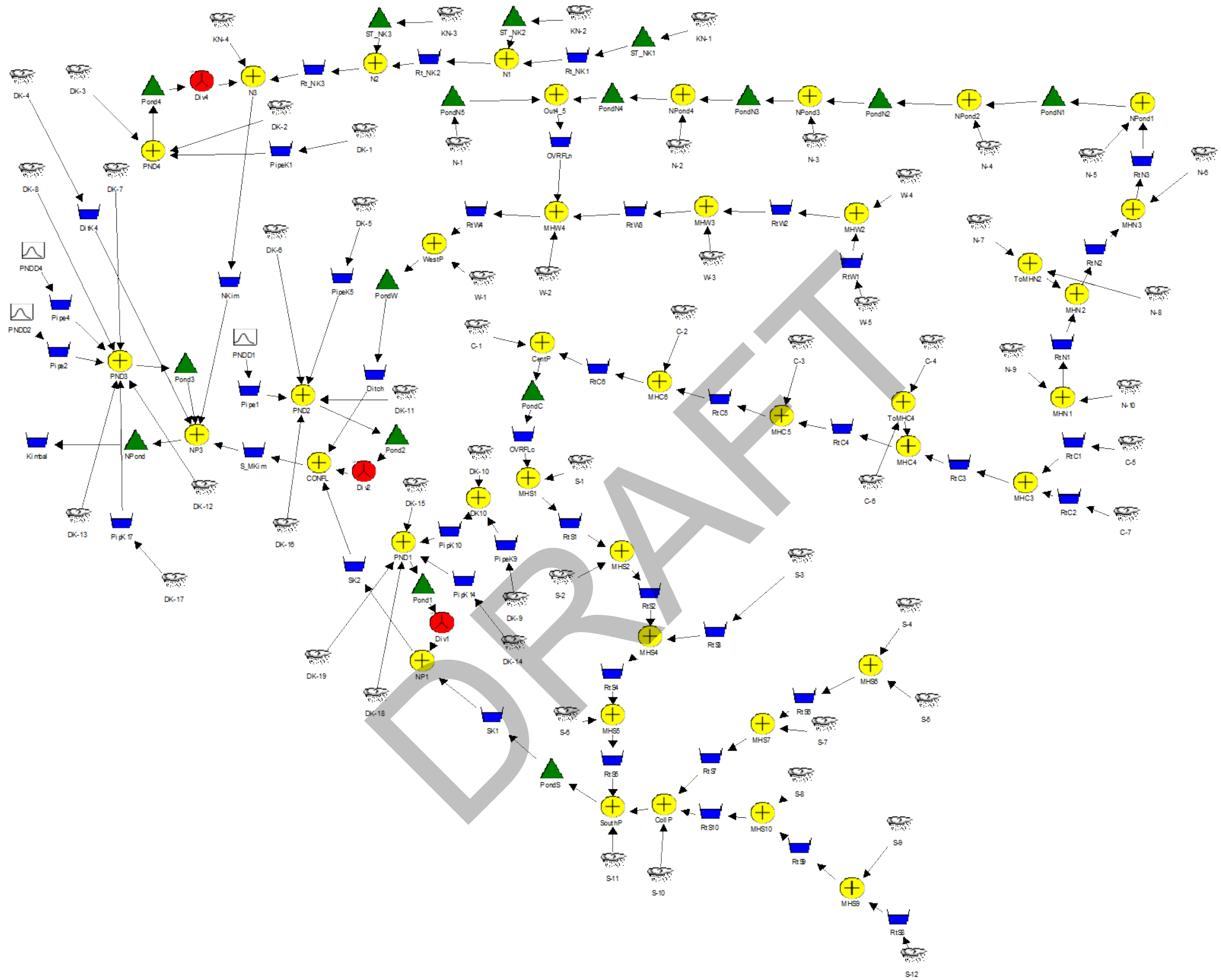


Figure 4-9a

State Route 65 Employment Village HEC-1 Model under Developed Conditions

Main Region for Sheds Draining to Kimball Creek

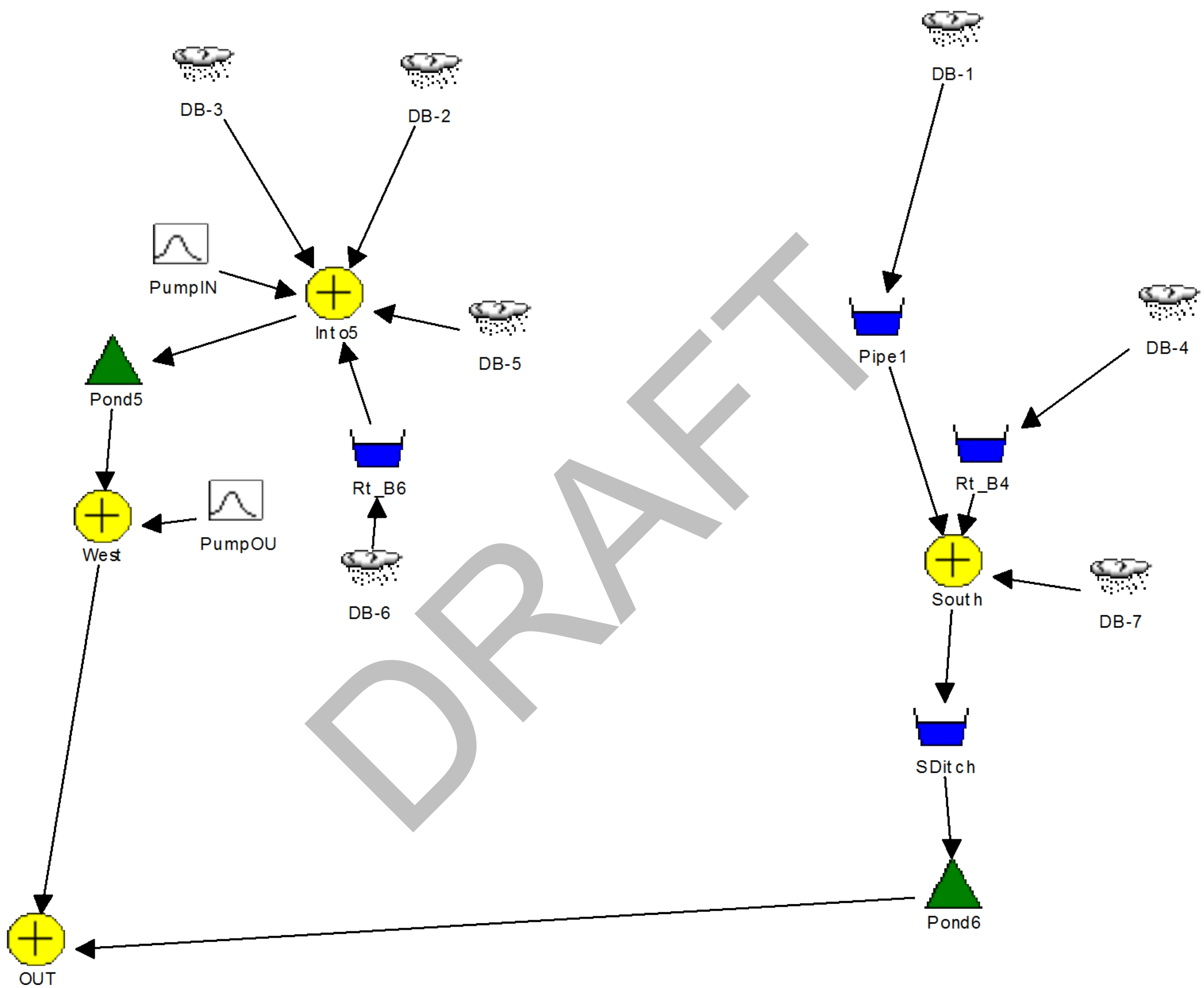


Figure 4-9b

State Route 65 Employment Village HEC-1 Model under Developed Conditions

South Region for Sheds Draining to Best Slough

4.8 Pond and Storm Drain Sizing

4.8.1 Developed Conditions HEC-1 and HEC-RAS Models

As previously mentioned, the sizing of the on-site storm drain system, pumps and ponds within the Magnolia Ranch Specific Plan area was accomplished using HEC-RAS version 4. HEC-RAS contains powerful hydraulic tools capable of fully analyzing the unsteady flow/elevation dynamics in pipes, pumps, channels, ponds, outlet structures and networks. HEC-1 was used to model the developed conditions at State Route 65 Employment Village outside the Magnolia Ranch area. HEC-1 was used to analyze the unsteady dynamics of outlet structures, weirs, pumps, and ponds. HEC-RAS was used for the areas outside Magnolia Ranch to size the trunk lines and the pond interconnections.

The Magnolia Ranch Specific Plan area has two discharge points corresponding to the historic drainage routes. Those two discharge points route into the remaining portion of the State Route 65 Employment Village, convey across the area via existing ditches and creeks, and the combined drainage has three discharge points out of the State Route 65 Employment Village corresponding to the historic drainage routes. Those locations and the general layout of the proposed storm drains and ponds were shown in Figure 4-3a, b and c. For the Magnolia Ranch Specific Plan area with two discharge points, it was convenient to build two HEC-RAS models; one covering all runoff and facilities that eventually discharges in the north route and one that covers the areas and facilities discharging to the south location. The “north” model includes all the “north” and “west” subsheds, the storm drain trunk lines for the north and west, the North Ponds and West Ponds, and the pump station at West Pond 2. The “south” model includes all the “south” and “central” subsheds, the storm drain trunk lines for the south and central, Central Pond and South Pond, and the pump station at South Pond. The screen shots of the layouts of each model are shown in Figures 4-10 and 4-11.

The models built have been run for simulated 10-year, 25-year and 100-year storms. The geometry in the models reproduces the actual planned sizes and characteristics of all features of the system. A partial list of those features and characteristics include:

- Trunk line diameters, slopes, lengths and Mannings roughness, with losses at manholes
- Pond stage vs. volume curves, top and bottom elevations (NGVD 29 values)
- Pump capacities and “on/off” elevations
- Complete geometry of pond outlet structures such as culverts, weirs or orifices
- Length, diameter, slope and Mannings roughness of pond interconnections
- The downstream channel representing Kimball Creek with appropriate parameters
- Manholes represented by small storage areas with correct dimensions

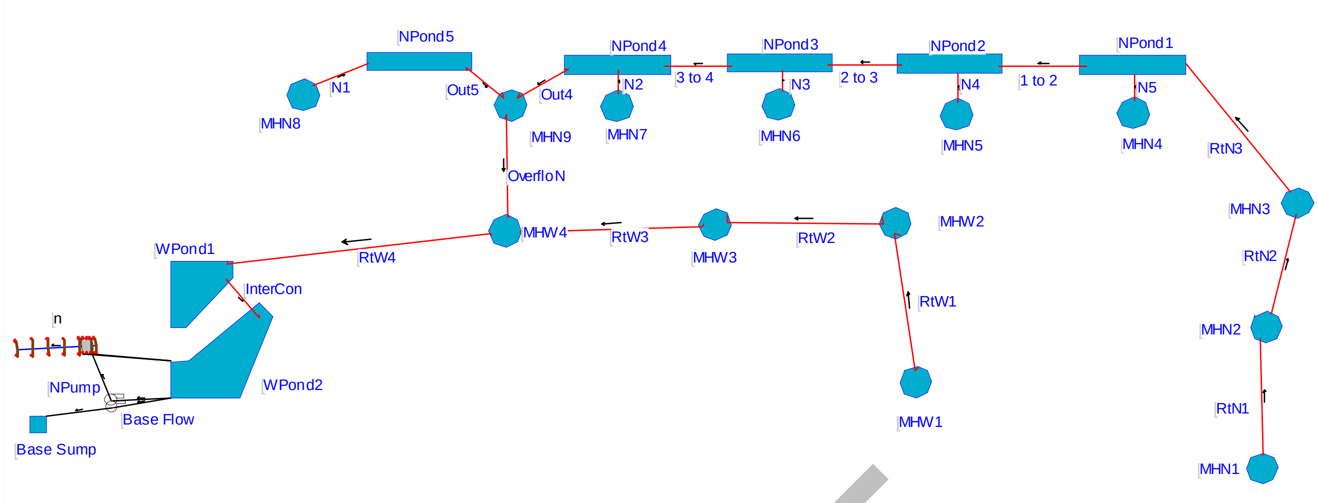


Figure 4-10

Screen shot of the HEC-RAS model for the north half of the Magnolia Ranch Specific Plan

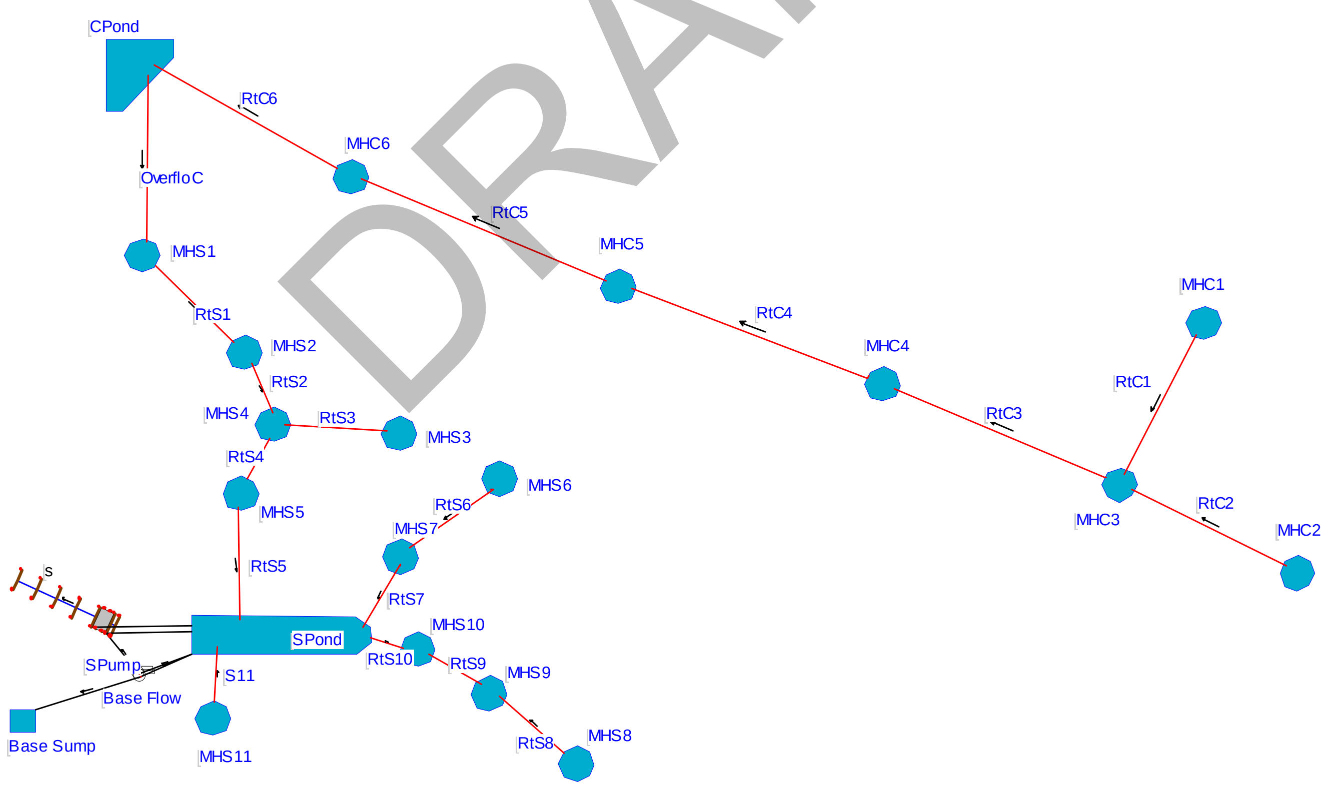


Figure 4-11

Screen shot of the HEC-RAS model for the south half of the Magnolia Ranch Specific Plan

Runoff hydrographs used in the Magnolia Ranch HEC-RAS models are from the developed conditions HEC-1 models discussed earlier. The runoff from each shed (Figure 4-7 and 4-9a) was introduced at the appropriate location in the HEC-RAS models via DSS.

The region of State Route 65 Employment Village west and south of Magnolia Ranch has three discharge points corresponding to the historic drainage routes, one into Kimball Creek and two into branches of Beast Slough. Those locations and the general layout of the proposed storm drains and ponds were shown in Figure 4-3a, b and c. For the overall State Route 65 Employment Village area, it was convenient to build two HEC-1 models; one covering all runoff and facilities that eventually discharge into Kimball Creek and one that covers the areas and facilities discharging in the south locations into branches of Best Slough. The Kimball Creek model includes all of Magnolia Ranch and the northern two-thirds of the rest of the State Route 65 Employment Village. That model is shown in Figure 4-9a. The Best Slough model includes about one-third of the State Route 65 Employment Village to the west and south of Magnolia Ranch. That model is shown in Figure 4-9b. The Kimball Creek model includes most of the ponds; all the Magnolia Ranch ponds plus ponds 1 through 4. The Best Slough HEC-1 model contains just the ponds 5 and 6.

HEC-1 provides unsteady analysis of the interconnected ponds and their outlook structures. To size the underground pipelines and storm drains for the State Route 65 Employment Village, HEC-RAS was employed on each individual line to arrive at an optimum size. The peak flow rates in the underground trunk lines and pond interconnections are generally reach with one foot or less excess HGL on the pipe's upstream end. The models built have been run for simulated 10-year, 25-year and 100-year storms. The geometry in the models reproduces the actual planned sizes and characteristics of all features of the system. The sizes and capacities determined and used in the models are summarized in section 4.3 of this report.

4.8.2 Modeling Assumptions and Constraints

The items described below are some of the modeling assumptions and approaches that were used to perform the hydrologic and hydraulic analysis. All references to elevations in this report are based on the NGVD 29 datum.

4.8.2.1 Collection and Trunk Systems of the State Route 65 Employment Village Plan — The drainage for the State Route 65 Employment Village area will include a network of underground pipelines. The following criteria and assumptions are used to evaluate and size the underground pipelines.

Storms — The collector system shall be able to handle runoff from a 10-year storm event. The trunk line system shall be able to handle runoff from a 25-year storm event.

HGL — The hydraulic grade line (HGL) during a 10-year event shall remain below the grate elevation of every DI.

Cover — Minimum cover over pipes shall be three (3) feet.

Velocity — The minimum velocity in the pipes flowing full shall be two (2) feet per second. The maximum velocity in the pipes during a twenty-five (25) year storm shall be eight (8) feet per second.

Friction Coefficient — Manning's "n" values shall be 0.013 for precast concrete pipe, 0.015 for cast-in-place concrete pipe and 0.022 for CPM.

Manholes — Manholes shall be located at a distance of not greater than four hundred (400) feet center to center. (Only the major trunk line manholes are included in this study)

Tailwater — Tailwater elevations assumed for trunk line outfalls shall be determined from HEC-RAS analysis of the detention ponds considering the overall drainage system.

4.8.2.2 Overall State Route 65 Employment Village Drainage System — State Route 65 Employment Village will utilizes a variety of drainage culverts, detention ponds, pump stations, swales and various other hydraulic structures. Discharge will be downstream offsite via historic drainage channels. The following criteria and assumptions are used in the hydraulic analysis of the overall proposed State Route 65 Employment Village drainage system.

Storms — The traditional Yuba County storm events shall be considered. Those include the 10-year 24-hour, the 25-year 24-hour and the 100-year 24-hour storms. Storm totals should follow Yuba County standards which currently recognize the Wheatland2NE gage.

Culverts — All existing or proposed culverts will be modeled with the "Highest U.S. E.G." option as opposed to specifying either "Inlet control" or "Outlet control". Inverts and diameters of all culverts will be specified in design or collected during field surveying. Standard values of entrance and exit losses will be utilized. Mannings "n" values will range from 0.013 to 0.022 depending on size and material.

Channel Characteristics and Roughness Factors — Some of the channels that may be modeled are man-made while others are primarily natural. Appropriate manning “n” values will be used ranging from 0.035 to 0.06 in the channels and 0.05 to 0.08 for the overbank area. Standard values of 0.1 and 0.3 will be used for contraction and expansion coefficients respectively. Hydraulic analysis of any water quality swales will use manning “n” values of 0.20 to 0.24 as specified by Caltrans standards.

Flows — Recognizing the unsteady (dynamic) nature of runoff and storage systems, flows required will be provided as flow hydrographs determined from the HEC-1 analysis.

Initial Conditions —For this study, under both pre-developed (current) conditions and post-development conditions, all ponds are considered to be empty at the start of all 24-hour storms.

Pump Stations – The Pump Stations in the Magnolia Ranch Specific Plan area discharge to Kimball Creek at two locations along Bradshaw Road. The Pump Station at Pond 5 in the southwester part of State Route 65 Employment Village discharges to a branch of Best Slough. At this point, the WSEL downstream at the three locations has no bearing on the pump station performance as the pumps are treated as having a conservative value of fixed nominal output rather than a head-dependent output. Thus, the model currently does not vary the pump discharge with the water surface changes in the ponds or in the downstream channel.

Backwater — The tailwater elevation for all trunk lines is the water surface level in one of the fifteen ponds. The rim of each pond is well above the channel downstream. The pump output is independent of the water level downstream and the gravity flow from the ponds is via culverts that will be equipped with exit flap gates where needed.

4.8.2.3 Detention Ponds — The State Route 65 Employment Village Plan will utilize fifteen new detention ponds in ten general locations. The following criteria shall be used to evaluate and size the detention ponds.

Pond Infiltration — While it is hoped that the ponds will provide some degree of infiltration, this study conservatively neglects any such effect.

Peak Outflows — The detention ponds shall be sized to eliminate any increase in flows or peak water surface elevations downstream from the State Route 65 Employment Village Plan on Kimball Creek and the affected branches of Best Slough. This requirement extends to all 24-hour, 10-, 25- and 100-year storm events, and to the emergency scenario of a pump failure.

Outflow Duration — The detention ponds shall be sized so that the duration of significant runoff to the downstream Kimball Creek is less than currently exists. For the purpose of this study, duration is defined as the total time the discharge remains above 50% of the current peak discharge for any given event.

Total 48-hour Outflow — The detention ponds shall be sized so that the total quantity of storm water discharged during a 48-hour period to the downstream channels is less than is currently discharged during the same storm. The 48-hour period shall start at the start of the 24-hour storm and extend for 24 after the end of the storm.

Capacity — This preliminary analysis suggests the total new storage required by the ponds will be approximately 804 acre-feet maximum at the pond rims, although that will never be reached because of the freeboard requirement.

Water Quality — The detention ponds where ever possible will also provide pretreatment of the runoff from the State Route 65 Employment Village Plan area prior to entering the downstream Kimball Creek and Best Slough. As explained in section 4.3 of this report, this will be accomplished through the use of native plants in the forebay, in the meandering low flow channel, on the slopes, on the flat bottom, and by the optimization of detention time.

Peak WSEL in Ponds — The peak water levels in the detention ponds shall be kept at a level advantageous to the HGL profile throughout the storm drain network. Additionally, the freeboard requirements shall be met, requiring a minimum of one foot in the 100-year event and two feet in the 25-year event.

Pond Interconnections — Underground conduits will be designed to connect many of the ponds to other ponds. All these interconnections have been modeled in HEC-RAS and reported in section 4.3 and Figures 4-3a, b and c of this report

Outfall Structures — Outfall structures will be provided just downstream of West Pond, South Pond, Pond 3, Pond 5 and Pond 6 in the historic tributaries to the Kimball Creek and Best Slough. The structures will incorporate diffusers to eliminate erosion even during the largest storm events

4.8.3 Design Downstream Flows

The goal of the storm drain system for the State Route 65 Employment Village is to deliver offsite flows that do not exceed current peak values, current duration or current 48-hour quantities to downstream channels. According to the HEC-RAS and HEC-1 simulations, the system of ponds, pumps, outlet structures and pond interconnections proposed have far exceeded the goal. For the purpose of this report, the duration is defined at the total time that a given storm produces offsite flows in excess of 50% of the peak flow that currently exists for that given storm event. The total outflow is defined here as the total volume of storm water delivered offsite during a 48-hour period beginning with the start of a 24-hour storm.

As mentioned previously, the HEC-RAS analysis for the Magnolia Ranch Specific Plan is broken into two models; one for the north part and one for the south part. Table 4-4a and Table 4-4b present the comparison of the outflows existing under current conditions with the proposed conditions under full development of Magnolia Ranch. Both HEC-1 and HEC-RAS simulations are used for the tables. The outflow locations were shown on previous figures. The HEC-1 analysis for the Highway 65 Employment Village area is also broken into two parts; the main north part which drains to Kimball Creek and the smaller south part which drains to two minor branches of Best Slough. Table 4-5, Table 4-6a and Table 4-6b present the comparison of the outflows existing under current conditions with the proposed conditions under full development of Highway 65 Employment Village, including Magnolia Ranch.

TABLE 4-4a

Comparison of the Outflow from the North Part of the Magnolia Ranch site under Current Conditions versus Developed Conditions. HEC-1 and HEC-RAS Simulations. Flows to the Middle Branch of Kimball Creek at Bradshaw Rd.

Storm Event	Attribute Simulated	Current Conditions	Developed Conditions
100-year 24-hour	Peak flow rate offsite downstream	18.6 CFS	6.5 CFS
	Duration of flow greater than 50% of the current 100-year peak (> 9.3 CFS)	42.4 hours	0 hours
	Total volume of outflow during 48 hours	44.4 acre-feet	20.5 acre-feet
25-year 24-hour	Peak flow rate offsite downstream	13.3 CFS	4.9 CFS
	Duration of flow greater than 50% of the current 25-year peak (> 6.7 CFS)	42.0 hours	0 hours
	Total volume of outflow during 48 hours	31.3 acre-feet	16.6 acre-feet
10-year 24-hour	Peak flow rate offsite downstream	9.7 CFS	4.0 CFS
	Duration of flow greater than 50% of the current 10-year peak (> 4.7 CFS)	42.7 hours	0 hours
	Total volume of outflow during 48 hours	22.4 acre-feet	15.5 acre-feet

TABLE 4-4b

Comparison of the Outflow from the South Part of Magnolia Ranch site under Current Conditions versus Developed Conditions. HEC-1 and HEC-RAS Simulations.

Flows to the South Branch of Kimball Creek at Bradshaw Rd.

Storm Event	Attribute Simulated	Current Conditions	Developed Conditions
100-year 24-hour	Peak flow rate offsite downstream	24.4 CFS	6.0 CFS
	Duration of flow greater than 50% of the current 100-year peak (> 12.2 CFS)	32.4 hours	0 hours
	Total volume of outflow during 48 hours	45.1 acre-feet	20.1 acre-feet
25-year 24-hour	Peak flow rate offsite downstream	17.5 CFS	4.0 CFS
	Duration of flow greater than 50% of the current 25-year peak (> 8.8 CFS)	31.9 hours	0 hours
	Total volume of outflow during 48 hours	38.7 acre-feet	15.9 acre-feet
10-year 24-hour	Peak flow rate offsite downstream	12.8 CFS	4.0 CFS
	Duration of flow greater than 50% of the current 10-year peak (> 6.4 CFS)	31.4 hours	0 hours
	Total volume of outflow during 48 hours	27.8 acre-feet	15.8 acre-feet

TABLE 4-5

Comparison of the Outflow from the Main Part of Highway 65 Employment Village site under Current Conditions versus Developed Conditions. HEC-1 Simulations.

Flows to Kimball Creek at Rancho Road

Storm Event	Attribute Simulated	Current Conditions	Developed Conditions
100-year 24-hour	Peak flow rate offsite downstream	246 CFS	195 CFS
	Duration of flow greater than 50% of the current 100-year peak (> 122.9 CFS)	21.6 hours	21.5 hours
	Total volume of outflow during 48 hours	473 acre-feet	426 acre-feet
25-year 24-hour	Peak flow rate offsite downstream	187 CFS	137 CFS
	Duration of flow greater than 50% of the current 25-year peak (> 93.5 CFS)	20.2 hours	16.3 hours
	Total volume of outflow during 48 hours	342 acre-feet	292 acre-feet
10-year 24-hour	Peak flow rate offsite downstream	145 CFS	96 CFS
	Duration of flow greater than 50% of the current 10-year peak (> 72.7 CFS)	19.4 hours	13.6 hours
	Total volume of outflow during 48 hours	259 acre-feet	220 acre-feet

TABLE 4-6a

Comparison of the Outflow from the South Part of Highway 65 Employment Village site under Current Conditions versus Developed Conditions. HEC-1 Simulations. Flows to the south of S. Beale Rd. into a branch of Best Slough

Storm Event	Attribute Simulated	Current Conditions	Developed Conditions
100-year 24-hour	Peak flow rate offsite downstream	56 CFS	45 CFS
	Duration of flow greater than 50% of the current 100-year peak (> 27.8 CFS)	7.1 hours	7.0 hours
	Total volume of outflow during 48 hours	42.7 acre-feet	40.3 acre-feet
25-year 24-hour	Peak flow rate offsite downstream	41 CFS	34 CFS
	Duration of flow greater than 50% of the current 25-year peak (> 20.7 CFS)	7.3 hours	7.2 hours
	Total volume of outflow during 48 hours	32.3 acre-feet	30.7 acre-feet
10-year 24-hour	Peak flow rate offsite downstream	32 CFS	26 CFS
	Duration of flow greater than 50% of the current 10-year peak (> 15.8 CFS)	7.7 hours	7.6 hours
	Total volume of outflow during 48 hours	25.1 acre-feet	24.1 acre-feet

TABLE 4-6b

Comparison of the Outflow from the Southwest Part of Highway 65 Employment Village site under Current Conditions versus Developed Conditions. HEC-1 Simulations. Flows to the west at Rancho Rd. into a branch of Best Slough

Storm Event	Attribute Simulated	Current Conditions	Developed Conditions
100-year 24-hour	Peak flow rate offsite downstream	52 CFS	27 CFS
	Duration of flow greater than 50% of the current 100-year peak (> 26.1 CFS)	8.1 hours	1.8 hours
	Total volume of outflow during 48 hours	46.7 acre-feet	45.5 acre-feet
25-year 24-hour	Peak flow rate offsite downstream	38 CFS	12 CFS
	Duration of flow greater than 50% of the current 25-year peak (> 19.2 CFS)	8.3 hours	0 hours
	Total volume of outflow during 48 hours	34.6 acre-feet	30.4 acre-feet
10-year 24-hour	Peak flow rate offsite downstream	29 CFS	9 CFS
	Duration of flow greater than 50% of the current 10-year peak (> 14.4 CFS)	9.1 hours	0 hours
	Total volume of outflow during 48 hours	26.4 acre-feet	21.7 acre-feet

As can be seen in the tables, the simulations indicate the three goals (limited peak flow, duration and volume) have been met.

4.8.4 Design Water Surfaces, Inflows and Outflows for the Detention Ponds

HEC-RAS and HEC-1 provide a complete look at the time-dependent nature of inflows, outflows and water surface elevations for the ponds in the system. This information will aid greatly in the design of the detention basins. Table 4-7 shows results for the Magnolia Ranch area for the simulation peak values of inflows, outflows and storage for all nine ponds and all three storm simulations. Table 4-8 represents the same information, but for the six ponds outside of Magnolia Ranch in the western and southern part of the Highway 65 Employment Village. The information in the tables indicates that the freeboard and peak outflow requirements have been met.

TABLE 4-7

Peak Water Surface Levels and Flows in the Magnolia Ranch Detention Ponds under Developed Conditions. HEC-RAS Simulations with the Pumps Operational.

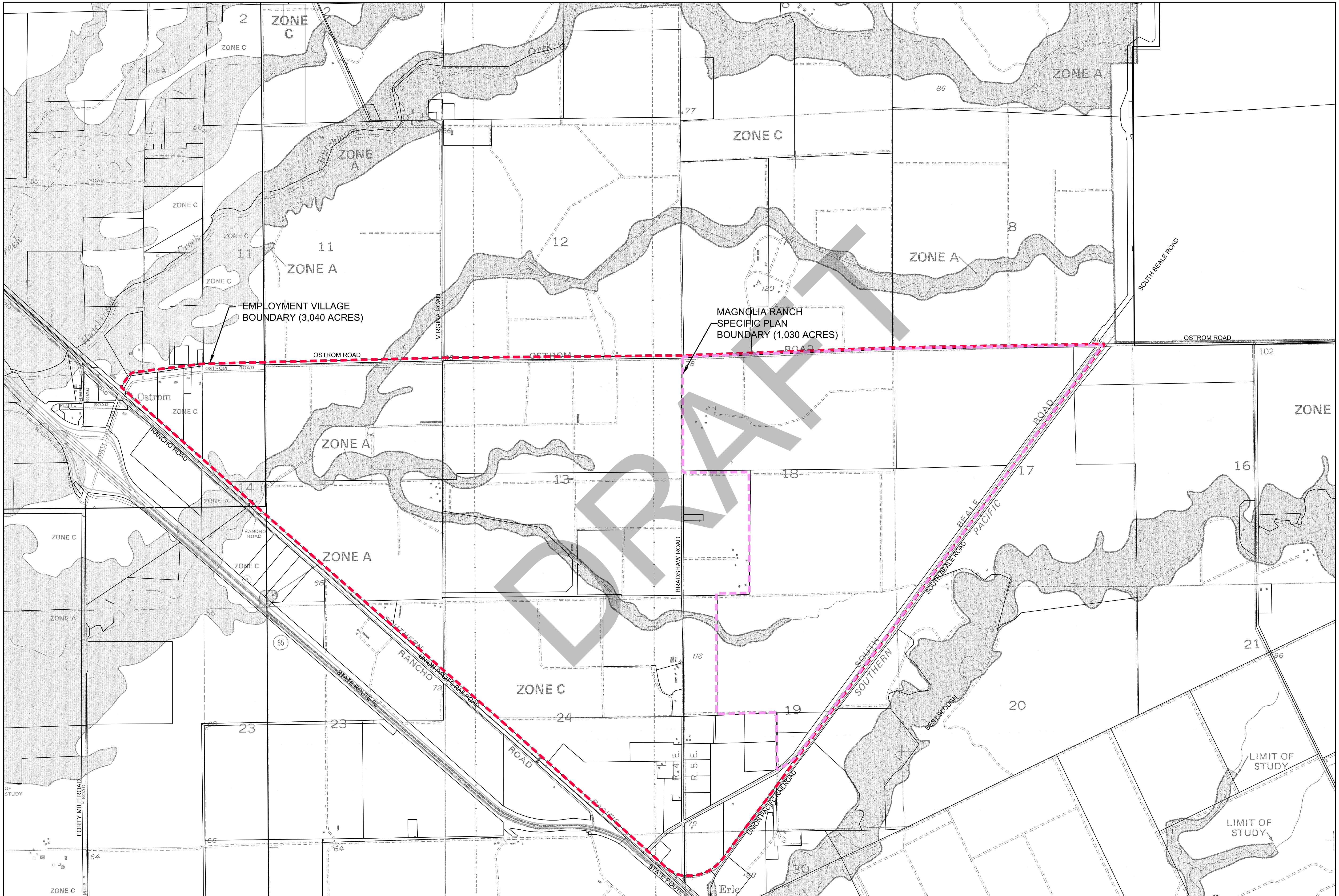
Pond	Storm Event	Peak Inflow, CFS	Peak Outflow, CFS	Peak WSEL, feet (NGVD 29)	Peak Storage, acre-feet
North 1	100-year 24-hour	176	113	81.98	14.2
	25-year 24-hour	132	98	80.06	10.3
	10-year 24-hour	97	86	78.59	7.8
North 2	100-year 24-hour	111	46	81.78	13.9
	25-year 24-hour	90	44	79.92	10.2
	10-year 24-hour	73	44	78.47	7.7
North 3	100-year 24-hour	48	41	78.80	9.9
	25-year 24-hour	42	35	77.70	8.2
	10-year 24-hour	37	30	76.83	7.1
North 4	100-year 24-hour	48	43	76.53	10.5
	25-year 24-hour	43	36	76.06	9.8
	10-year 24-hour	36	31	75.65	9.2
North 5	100-year 24-hour	45	6	75.88	6.0
	25-year 24-hour	35	4	74.14	4.5
	10-year 24-hour	28	4	72.51	3.4
West 1	100-year 24-hour	183	193	76.15	16.8
	25-year 24-hour	140	151	74.49	10.1
	10-year 24-hour	113	122	72.94	4.2
West 2	100-year 24-hour	203	6	76.15	76.0
	25-year 24-hour	158	5	74.49	64.9
	10-year 24-hour	127	4	72.94	54.9
Central	100-year 24-hour	255	19	76.98	27.3
	25-year 24-hour	199	17	75.10	20.3
	10-year 24-hour	157	15	73.77	15.5
South	100-year 24-hour	353	6	76.46	91.5
	25-year 24-hour	276	4	74.82	71.5
	10-year 24-hour	223	4	73.58	56.8

TABLE 4-8
Peak Water Surface Levels and Flows in the State Route 65 Employment Village Detention Ponds under Developed Conditions. HEC-1 Simulations with the Pumps Operational.

Pond	Storm Event	Peak Inflow, CFS	Peak Outflow, CFS	Peak WSEL, feet (NGVD 29)	Peak Storage, acre-feet
Pond 1	100-year 24-hour	578	60	72.98	65.8
	25-year 24-hour	465	38	71.50	52.3
	10-year 24-hour	385	32	69.92	39.4
Pond 2	100-year 24-hour	458	73	69.81	70.6
	25-year 24-hour	370	56	69.40	66.7
	10-year 24-hour	307	37	68.27	56.8
Pond 3	100-year 24-hour	605	143	62.34	105.7
	25-year 24-hour	485	112	62.16	102.2
	10-year 24-hour	398	84	61.97	98.5
Pond 4	100-year 24-hour	469	65	62.87	48.7
	25-year 24-hour	379	52	61.67	36.3
	10-year 24-hour	315	43	60.77	28.2
Pond 5	100-year 24-hour	471	27	73.19	79.9
	25-year 24-hour	383	12	71.81	66.6
	10-year 24-hour	320	9	70.57	55.7
Pond 6	100-year 24-hour	76	45	75.02	10.2
	25-year 24-hour	57	34	74.25	7.1
	10-year 24-hour	44	26	73.71	5.2

4.9 LOMR-F and/or CLOMR-F Indications

The existing FIRM Panels # 060427-0360B/0370B/0400B cover all of the State Route 65 Employment Village Plan area. The FIRM Panels are shown in Figure 4-12. Zone A areas associated with Kimball Creek extend in “fingers” across much of the State Route 65 Employment Village Plan area. There are no Zone A regions in the study area associated with tributaries to Best Slough. Much of the Zone A area will be in designated open space, storm drainage areas or planned ponds. Those areas can remain as Zone A without influencing surrounding development. For other areas where development is planned, past agricultural grading has in some cases raised the ground level. Still in other areas development in the State Route 65 Employment Village Plan will likely raise the ground level further and either a CLOMR-F or a LOMR-F application could be used to remove the Zone A from those areas.



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Designed by: MHM INCORPORATED
Date: 04-30-13
Rev: 100%
Dwn by: SMM
Reviewed by: JMS
Design file no: 13122
Submitted by:
Drawing Code:
File name:
Plot date: 04-30-13
Plot scale:
Sean M Minard RCE 52593

FIGURE 4-12
PROJECT AREA WITH A PORTION OF FIRM PANELS 06-0427-0360B/0370B/0400B

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 4-12

Dwg.:13-122

4.10 Background Information

Numerous entities developed the information that has been used in the preparation of this Basis of Design Report. This information consists of reports, maps, drawings, and manuals. The most important are listed below.

1. ***Basis of Design Report, Magnolia Ranch Specific Plan, Proposed Drainage Improvement, Preliminary Analysis,*** MHM Incorporated, August 22, 2012.
2. ***South Yuba Drainage Master Plan – Yuba County Public Works Department,*** MHM Incorporated, May 15, 2012. (Approved by BOS June 12, 2012)
3. ***Interior Drainage Study – PAL Area Extension, LOMR Application Narrative – East Linda Extension, Case #11-09-0045P,*** MHM Incorporated, September 17, 2010.
4. ***LOMR Application for Reclamation District 784 Basin A, Basin B and Basin C Yuba County California,*** MHM Incorporated, March 14, 2009. (Part of County-Wide Study #08-09-0895S)
5. ***Interior Drainage Study RD784 Levee and Flood Control System, FEMA Accreditation Project, Three Rivers Levee Improvement Authority,*** MHM, Incorporated, April 14, 2010.
6. ***Yuba County 2030 General Plan Update***, Adopted June 7, 2011, Yuba County Planning Department, Marysville, California.
7. ***Technical Advisory, CEQA and Low Impact Development Storm water Design: Preserving Storm water Quality and Stream Integrity Through California Environmental Quality Act (CEQA) Review,*** GOVERNOR'S OFFICE OF PLANNING AND RESEARCH, Sacramento, California, August 5, 2009
8. ***LOMR Case #06-09-B119P for East Linda Area, South Olivehurst Interceptor, Yuba County, California,*** December 29, 2005, MHM Incorporated.
9. ***LOMR Case #07-09-1090P for South Olivehurst area, Yuba County, California,*** April 4, 2007, MHM Incorporated.
10. ***LOMR Case #06-09-BD46P for Sage/Graf Property, Yuba County, California,*** September 28, 2007, Nolte Associates, Inc.
11. ***Flood Insurance Study; Yuba County (Unincorporated Areas)***, November 17, 1981, Federal Emergency Management Agency.
12. ***Bear River, California – Feasibility Report for Water Resources Development***, U.S. Army Corps of Engineers, September 1972.
13. ***Hydraulic and Hydrologic Analysis of the Three Rivers Levee Improvement Authority's Phase IV Project,*** December 2006, MBK Engineers, Sacramento, California.
14. ***Hydraulic and Hydrologic Documentation for FEMA Certification of the Three Rivers Levee Improvement Authority Project,*** December 2006, MBK Engineers, Sacramento, California.

15. ***Lower Feather River Floodplain Mapping Study – Bear River Hydrology, Appendix B,*** April 2004, Floodplain Management Section of The Corps of Engineers, Sacramento District.
16. ***South Yuba Drainage Master Plan,*** September 1981, MHM Incorporated
17. ***Revised South Yuba Drainage Master Plan,*** March 1991, MHM Incorporated
18. ***Woodbury Planned Community, Specific Plan Area, Technical Memorandum, Storm Drainage****, May 22, 2006, MHM Inc., Marysville*, California.
19. ***Sutter-Placer Watershed Area Study***, April 1982, USDA Soil Conservation Service and USDA River Basin Planning Staff.
20. ***Sacramento River Flood Control System Evaluation; Initial Appraisal Report – Mid-Valley Area***, December 1991, U.S. Army Corps of Engineers, Sacramento District.
21. ***Yuba County Plumas Lake Specific Plan***, updated April 19, 2005.
22. ***Hydrology Review Report – Linda and Olivehurst Drains, Bear River Basin,*** January 1980, U.S. Army Corps of Engineers, Sacramento District
23. ***North Arboga Study Area – Drainage Analysis,*** April 1992, MHM Incorporated
24. ***Olivehurst Interceptor – Phase 1A, PS&E,*** August 15, 1995, MHM Incorporated.
25. ***Basis of Design Report, Olivehurst Interceptor Project, Hazard Mitigation Grant Program,*** MHM Incorporated, March 1998.
26. ***RD784 Drainage Basin A, Drainage Master Plan, Basis of Design Report***, MHM Incorporated, September 30, 2008.
27. ***RD784 Drainage Basin B, Revised Drainage Master Plan***, MHM, Incorporated, December, 2007.
28. ***RD784 Drainage Basin C, Drainage Master Plan, Basis of Design Report***, MHM Incorporated, April 30, 2009.
29. ***Reclamation District 784 Master Drainage Plan,*** September 2002, Mead and Hunt, Inc.
30. ***Topographic Surveys of the Lower Feather and Bear Rivers for the Sacramento and San Joaquin River Basins Comprehensive Study, California, Contract DACW05-99-D-0005***, February 14, 2006, Towhill Inc., San Francisco, CA.
31. ***HEC-1 Flood Hydrograph Package,*** U.S. Army Corps of Engineers, September 1990.
32. ***HEC-1 Flood Hydrograph Package User's Manual,*** U.S. Army Corps of Engineers, Hydrologic Engineering Center, June 1998.
33. ***HEC-RAS River Analysis System, Version 4.0,*** U.S. Army Corps of Engineers, March 2008.
34. ***HEC-RAS River Analysis System User's Manual,*** U.S. Army Corps of Engineers, Hydrologic Engineering Center, March 2008.
35. ***PondPack Urban Hydrology & Detention Pond Modeling Software,*** Version 10, Haestad Methods, Inc., March 2005.
36. ***Introduction to Hydraulics and Hydrology with Applications for Storm water Management, 2nd. Ed.,*** 2002, John Gribbin, Delmar Thomson Learning.

37. ***Rainfall Analysis for Drainage Design - Bulletin No. 195***, October 1976, Department of Water Resources.
38. ***Rainfall Depth-Duration-Frequency Data***, Department of Water Resources, California State Meteorologist, **http://www.water.ca.gov/floodmgmt/hafoo/hb/csm/engineering/**
39. ***Soil Survey of Yuba County***, United States Department of Agriculture, Soil Conservation Service
40. ***Web Soil Survey***, online: **http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx,** U.S. Department of Agriculture, Natural Resources Conservation Service.
41. ***Standard Plans and Specifications***, 2006, California Department of Transportation.
42. ***Improvement Standards***, County of Yuba.
43. ***2009 Contract Cost Data***, California Department of Transportation.
44. ***Heavy Construction Cost Data 2009***, 14th Edition, Means.

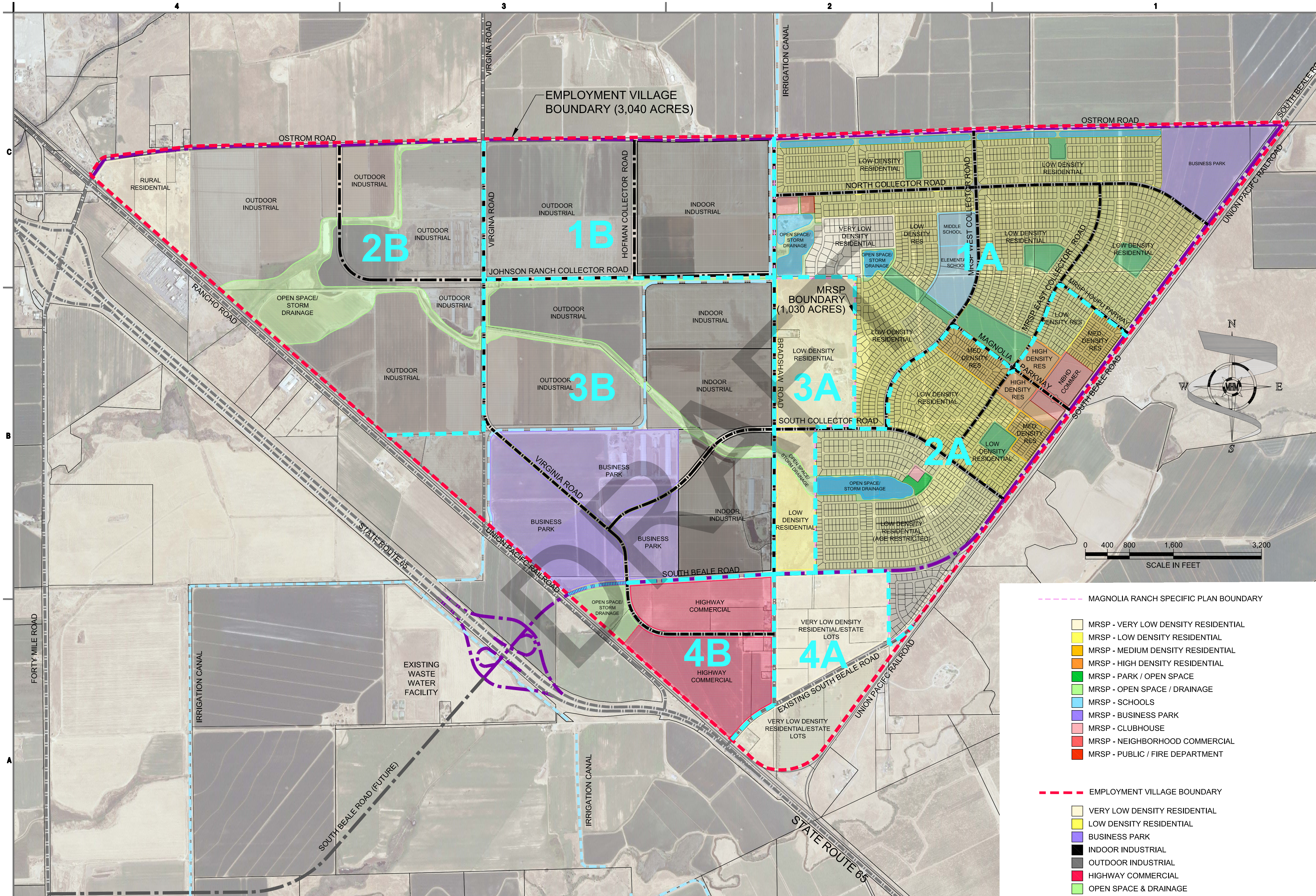
5 - Phasing of Infrastructure

5.1 Summary

The phased construction of the individual infrastructure components was covered within each section, but as a whole the State Route 65 Employment Village can be phased in many different ways. The existing major roads provide access to much of the Village area and path for other utilities, but these roads will need to be upgraded in accordance with this circulation plan with any development project. Any development project within the Village area will need to develop a new sewer collection system with major components in accordance with this plan and connect that system to the OPUD waste water facility with the first phase. Any development project within the Village area will also have to install the water transmission lines in accordance with these plans and develop the wells and water storage facilities required with the first phase. Finally any development project within the Village area will have to construct the storm drainage infrastructure delineated in this plan to collect and mitigate the runoff from the development.

The Magnolia Ranch Specific Plan is on track to be the first development within the State Route 65 Employment Village area. The MRSP has begun the process of developing a phased plan for its development that includes infrastructure components. This information has been incorporated within the sections of this document. As the MRSP develops the infrastructure to support itself, it opens up the development for the adjacent Employment Village area by reducing the amount of components that those areas would have to construct in order to develop.

The County can use the potential phasing information to assist in the preparation of conditions of approval. The developer reserves the right to modify the configuration and size of the phases. The information within the text provides more detailed timing of infrastructure and will be used if the potential phasing plan is modified. Any amendment to the State Route 65 Employment Village Technical Master Plan including but not limited to amendments to the phasing plan, shall be considered administrative amendments, and shall be subject to approval by Yuba County.



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Symbol	Description	Date	Approved

Designed by: MHM INCORPORATED
Date: 04-30-13
Rev. 100%
Dwn by: SMM
Reviewed by: JMS
Design file no: 13122
Submitted by:
Drawing Code:
Sean M Minard RCE 52593
File name:
Plot date: 04-30-13
Plot scale:

FIGURE 5-1
VLIIAGE PHASING

Job Title:
TECHNICAL MASTER PLAN FOR:
State Route 65 Employment Village
County of Yuba
Community Development and Services Agency

Drawing reference number
FIGURE 5-1

Dwg.:13-122