Infrastructure Study
for the
Byron Airport

Project for:

Contra Costa County, California

Mead
&Hunt
www.meadhunt.com

August 2013

Table of Contents

Appendices

1. Introduction

The Contra Costa County Airports Division is planning for development of the Byron Airport (Airport) as permitted under the Byron Airport Master Plan. As part of planning the Airport development, the existing utilities will need to be upgraded to serve the additional development areas. The Airport is currently served by a fire protection system consisting of a 3,000 gallons per minute (gpm) fire pump and a looped pipeline system with 20 fire hydrants. The sanitary sewer system consists of approximately 2,500 linear feet (LF) of sanitary sewer collection main, a 3,000-gallon septic tank, lift station, and drain field. The domestic water system consists of a groundwater well, chlorine feed system, 4,000-gallon storage tank and booster pump, and approximately 2,000 LF of small diameter distribution mains.

The purposes of this study are to evaluate capacity limits for the existing fire protection system, sanitary sewer system, and domestic water system to determine capacity remaining in the systems to accommodate development; identify and analyze necessary infrastructure improvements needed for development; and to prepare cost estimates and an implementation plan to upgrade the systems mentioned above for full build-out of the Byron Airport Master Plan. The Airport Layout Plan (ALP) is included in Appendix A.

In addition, a general review of the private utilities and storm drainage system at the Airport has been included in this study.

1.1 Airport History

From the Contra Costa County website:

> *Studies carried out by Contra Costa County in the late 1970's / early 1980's identified the need for one or more airports in the County to relieve the aircraft parking and operational pressures on Buchanan Field Airport in Concord. Continued urbanization in the western and central sections of the County made it impossible to develop a new airport in those areas. The County then focused its attention on finding a site for a new airport in the eastern part of the County. The East Contra Costa County Airport Master Plan completed in May 1986 was the third of three documents prepared as part of the East Contra Costa County Airport Site Study, the others being the Phase 1: Site Identification and Evaluation (October 1984) report and the Environmental Impact Report: East Contra Costa Airport (Draft, September 1985; responses to comments, January 1986). Preparation of an Airport Layout Plan for the Byron site and assessment of the environmental impacts of airport development at Byron were presented in the Environmental Impact Report (EIR). The EIR was reviewed by governmental agencies as well as the general public, responses to comments were prepared, and the document was subsequently certified by the County Planning Commission.*
>
> *The site evaluation culminated in the County Board of Supervisors' selection of the Byron Airpark (a small privately owned airport located in the southeastern area of the County) to provide aviation facilities for the residents of East Contra Costa County. The Byron Airpark was purchased in 1986, and the new airfield constructed in the early 1990's. The new Byron Airport was opened to the public*

in October 1994, replacing the Byron Airpark that occupied the northwest corner of the current airport property. The Airport is 1307 acres with the majority (814 acres) of the land reserved for Habitat Management Land for a variety of endangered and special status species of mammals and plant life.

2. Byron Airport Master Plan Potential Development

The main goal of the Airport Master Plan was to determine land usage guidelines for accommodating future airport functions, including general aviation, airport support, aviation-related land uses, and non-aviation land uses. The Airport Master Plan categorized the potential future land development into two categories; near-term aviation-related land uses and long-term aviation-related land uses.

From the Contra Costa County Byron Airport Master Plan, adopted in June 2005 regarding development at the Airport:

- *Cargo development at Byron Airport would be expected to follow a development cycle. Large air cargo aircraft operations are unlikely in the next 10 to 15 years, and likely Airport activities in the short-term will result from trucking activity and the Airport's relationship to other airports. Feeder (or propeller) aircraft represent the most likely source of initial air cargo activity and incremental growth at the Airport, building on trucking activity.*

- *Regional economic trends will likely support aviation growth. The eastern section of Contra Costa County, in which the Airport is located, has experienced growth in residential and industrial development as population and business activity force new development outside more developed areas of the East Bay (specifically, Alameda County). This trend is expected to continue in the long-term. Diversified regional development, including office, light industrial, warehousing and logistical, and residential development would likely facilitate economic and aeronautical growth.*

- *The Bay Area's general aviation market has a long-term need for facilities. Corporate aviation has been and is expected to be one of the fastest growing general aviation market segments, and is expected to spur demand for aircraft hangar storage and for the fixed base operators that support such corporate activity.*

- *The major factors that will affect the potential development of air cargo and general aviation are external to the Airport. There is currently a low concentration of "cargo-generating" business and a low concentration of population and business relevant to general aviation, surrounding the Airport. Improvements of the regional road and highway network would also be needed.*

- *Developments on-Airport could support and enhance regional development and the potential for air cargo and general aviation. Incremental development of general aviation and specialty aviation activity at Byron Airport would attract and facilitate aviation support services useful to potential air cargo feeder operators. Incremental development of non-aeronautical property at Byron Airport would assist in generating sufficient local business activity that could support air cargo development, including office and light industrial parks and distribution centers.*

The near-term and long-term land use areas were analyzed for setbacks and clearances required by the Federal Aviation Administration (FAA) standards[1] to facilitate the safe and efficient operation of the airport. Based upon the required setbacks and clearances, the usable developable areas were defined.

2.1 Analysis of Setbacks and Clearances

As indicated on the ALP, the Airport's "Ultimate" Airport Reference Code (ARC) for Runway 12-30 is B-III and for Runway 5-23 is B-II. The Airport's "Ultimate" Approach Type: FAR Part 77 Category and Visibility Minimums are as follows: Runway 12 is Non-precision [C] with ≥ ¾ mile visibility, Runway 30 is Precision [PIR] with < ¾ mile visibility, and Runway 5-23 is Visual [B(V)] with 1 mile visibility (Circling). These runway characteristics are used to establish the appropriate horizontal setbacks and vertical clearances for adjacent development.

FAA regulations specify the horizontal setbacks and vertical clearances as being appropriate for the "Ultimate" development configuration of Byron Airport as detailed in the ALP. The most controlling standards are those detailed in Federal Aviation Regulation Part 77. In particular, the need to preserve the Airport's Primary Surfaces, Transitional Surfaces, and Approach Surfaces from incompatible development (height-related only) is paramount. The most restrictive aspect of the Airport's "Ultimate" use is the Precision instrument approach capability being reserved for Runway 30.

The **Primary Surface** for a Precision runway is longitudinally centered on the runway, is 1,000 feet wide, and extends 200 feet beyond the runway ends. The Primary Surface should be maintained clear of all obstructions and equipment not specifically required for aeronautical purposes (e.g., approved aeronautical equipment includes runway edge lights, runway end identifier lights, airfield directional signs, etc.).

The **Approach Surfaces** are longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.

The **Transitional Surfaces** extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7:1 from the sides of the Primary Surface and from the sides of the Approach Surfaces to the base of the overlying Horizontal Surface at 150 feet above the airport's elevation.

These surfaces serve to identify the standards used to determine obstructions to air navigation used in the processing of aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities, or equipment. While these standards are somewhat advisory in nature, both the FAA and the California

[1] Federal Aviation Regulation Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace and FAA Advisory Circular 150-5300-13A – Airport Design

Division of Aeronautics strongly urge that no obstructions – in particular, new structures – penetrate these surfaces.

2.2 Setbacks and Clearances

The setback and clearances surfaces described above combine to significantly reduce the amount of land that can be readily developed at the Airport.

2.2.1 Setbacks and Clearances Lateral to Runway 12-30

The Runway Safety Area (RSA) restricts development within 500 feet of the Runway 12-30 centerline. Beyond that, all development should fall below the 7:1 overhead Transitional Surface. The ALP depicts a 600-foot Building Restriction Line (BRL). This reflects the assumption that a 14-foot tall structure could be sited at that lateral distance from the runway centerline. Similarly, a 25-foot tall structure could be located no closer than 675 feet laterally from the Runway 12-30 centerline. Taller structures would have to be sited even further away from the runway centerline. The RSA, 14-foot tall structure BRL, and 25-foot tall structure BRL, and their effect on parcel development are depicted on the Development Plan Exhibit included in Appendix B. The 25-foot tall BRL was used to determine the developable areas for this analysis. The area between the 14-foot tall BRL and 25-foot tall BRL could be reserved for landscaping or parking areas.

It should also be noted that a large irrigation canal (Byron Bethany Irrigation District 45 Canal) traverses much of the northeastern development area and a large detention basin is sited on a portion of the eastern area. These facilities and their associated setbacks further reduce the availability of developable sites within these areas (see Development Plan Exhibit in Appendix B).

Considering these constraints and recognizing that some structure height restrictions apply, it is estimated that approximately 3.3 acres of developable land is available in the northeastern area and approximately 18.0 acres of developable area is located in the eastern area.

It is estimated that approximately 20.2 acres of developable land is available in the two northeastern areas and 40.4 acres of developable area is located in the two eastern areas.

On the western side of the Airport, the ALP depicts a BRL located 600 feet from the Runway 12-30 centerline. At that lateral distance from the Runway 12-30 centerline, the overlying Transitional Surface is positioned approximately 14 feet above the Airport's elevation. This is an adequate height for the siting of small aircraft storage hangars and other one-story structures. Taller structures could be developed further from the runway centerline provided that they remain below the overlying 7:1 Transitional Surface. Considering these constraints and recognizing that some structure height restrictions apply, it is estimated that approximately 15.7 acres of long-term developable land is available in the northwestern area and approximately 55.4 acres of developable area for near-term development is located in the two areas to the west of Runway 12-30.

2.2.2 Setbacks and Clearances Lateral to Runway 5-23

In the southwestern corner of the Airport, ultimate development of the proposed "Aviation-related uses" area is impacted by the presence of Runway 5-23. As noted above, this crosswind runway will remain an ARC B-II / Visual runway. Accordingly, the Part 77 Primary Surface is 500 feet wide (i.e., 250 feet laterally from runway centerline). The associated Transitional Surfaces begins at the outer edge of this Primary Surface and extend laterally and vertically at 7:1. The 350-foot BRL depicted on the ALP represents the siting of a 14-foot tall structure. This is an adequate height for the siting of small aircraft storage hangars and other one-story structures. Taller structures could be developed further from the runway centerline provided that they remain below the overlying 7:1 Transitional Surface. In addition, FAA design standards specify a 65.5-foot setback (Taxiway Object Free Area) from the centerline of the parallel taxiway serving Runway 5-23.

Considering the above constraints and recognizing that some structure height restrictions apply, it is estimated that approximately 11.9 acres of developable land is available in the southwestern area.

As a caveat to this discussion, the FAA is in the midst of its nationwide implementation of Precision instrument approach capability based on the Global Positioning System (GPS). In the future, it is possible that some of the above referenced Part 77 surface dimensions and related runway setbacks may be reduced to enable small general aviation airports such as Byron to be served by a GPS-based Precision approach with less of an impact on siting ground structures.

2.3 Near-Term Potential Development

According to the 2005 Master Plan, the near-term planning scenario was meant to correspond a time frame from 2008-2010. However, since the near-term time frame has passed as of the date of this report, the updated near-term time frame is from 2013-2018. The near-term aviation-related land use area is located west of the intersection of the two runways, and is reserved for general aviation and airport support. The total area reserved for these uses is approximately 84 acres. However, the total developable area is reduced to approximately 55.4 acres due to the setbacks and clearances described above. Refer to Appendix B for a map of the reserved areas and developable areas.

In addition, in order to facilitate movement of ground vehicles and to maintain runway approach and safety requirements, it is recommended that Falcon Way be upgraded and extended to provide access to these areas.

2.4 Long-Term Potential Development

According to the 2005 Master Plan, the long-term planning scenario corresponds to a time frame from 2023-2025. However, since the near-term time frame has passed as of the date of this report without development, the updated long-term time frame is from 2031-2033. The long-term aviation-related land use area is located north and east of Runway 12-30 and immediately north of Runway 5-23, and is reserved for airport related development (future taxiways, aircraft parking aprons, and airport-related facilities). The total area reserved for these uses is approximately 179 acres. However, the total developable area is reduced to approximately 91.5 acres due to the setbacks and clearances described above. In addition, the 18 acres east of Runway 5-23 is not considered available for major development since it is located at the extension of the runway and is currently used as a storm drainage detention basin. It appears that the detention basin may be expanded to allow for future development. Refer to Section 7 below for storm water evaluation. Refer to Appendix B for a map of the reserved areas and developable areas.

3. Fire Protection System

3.1 Existing Fire Protection System

The existing fire protection system consists of approximately 11,000 feet of pipeline and 20 hydrants, and is supplied by a 100-horsepower (HP) fire pump which is located in a pump house on the northeast side of Runway 12-30. The Airport is required to maintain the capacity to fight the design fire which includes fire flows of 3,000 gpm from three hydrants flowing simultaneously with 20 pounds per square inch (psi) residual pressure in the main. The duration of the design fire is three hours. The minimum requirement is to provide water storage and pumping capacity for one design fire.

The existing fire pump has a design pumping capacity of 3,000 gpm. The fire protection system was designed for three hydrants flowing simultaneously for three hours with 20 psi residual pressure in the main. The fire pump is supplied by a lined fire protection pond which receives water from the Byron Bethany Irrigation District. There is also an emergency pump station located southeast of the runway intersection that provides water from an underground 96-inch diameter pipe as a supplement to the fire pump pond.

In order to provide enough water to meet the fire protection system requirements, the pond requires a minimum capacity of 540,000 gallons. The lined pond has been estimated to contain a storage capacity of approximately 750,000 gallons based on the construction record drawings. Approximately one million additional gallons of water is available from the 96-inch diameter pipe. During irrigation season when the Bethany Irrigation District canal is in operation, typically May through October, the pond may be refilled as needed and there is no limitation to water supply for fire protection. Outside of irrigation season, the supply of water available for fire protection is limited to the storage within the pond and 96-inch diameter pipe.

Based on available storage capacity, the Airport currently has sufficient storage to fight approximately three design fires outside of irrigation season and no limit during irrigation season. The fire pump has the capacity to fight one design fire at a time, which meets current requirements.

The Airport has been experiencing difficulties with the fire pump and has had to replace it twice in recent years. The fire pump is currently operating without any reported issues.

3.2 Existing Fire Protection System Capacity

The existing fire protection system was modeled using WaterCAD Version 8i developed by Bentley Systems, Inc. The WaterCAD program is a design tool used to model water supply systems and calculates how much flow is available at any hydrant or group of hydrants in the system, based on supply, pressure and flow constraints. Fire flows were simulated near the western end of Runway 12-30 because hydrants at this location are furthest from the fire pump. The modeling assumed that adequate water storage was available for the duration of the fire, and that the fire pump is performing as indicated on the manufacturer's pump curve. The results of the model confirmed that the fire protection system is capable of supplying three hydrants simultaneously with a flow of 1,000 gpm each for three hours, while maintaining a minimum of 20 psi residual pressure in the water main pipeline. The WaterCAD model report is included in Appendix C. The existing system meets the current fire protection requirements of the Contra Costa County Fire Protection District and the National Fire Protection Association.

3.3 Fire Protection System for Potential Development

3.3.1 On-Site Fire Protection System

The fire protection system extensions required to service the near-term and long-term future development connects to the existing system and is shown on the Utilities Plan in Appendix D. The near-term and long-term fire protection improvements include approximately 9,100 feet and 12,600 feet of 12-inch pipeline, respectively to serve the development areas. The pipeline extensions would provide a looped system to maintain pressure in the pipeline, extend fire protection to all areas, and add flexibility of water delivery if sections need to be isolated for maintenance.

The fire flow requirements are based on the 2010 California Fire Code (Part 9 of the Title 24, California Code of Regulations (CCR). Future code updates may require changes to the fire flow requirements.

The future fire protection system was modeled using WaterCAD to verify adequate volumes and pressure of water for fire protection and to verify pipe sizing for the future pipelines. The fire protection pipeline was assumed to be 12-inch PVC, which matches the existing system pipes, and fire hydrants were modeled at maximum 500-foot spacing. The model simulated the fire along Runway 5-23 because this is the most remote part of the future system and is not fully looped. The results of the model concluded that the existing fire pump is capable of supplying water to three hydrants simultaneously with a flow of 1,000 gpm each, while maintaining a minimum of 20 psi residual pressure in the water main pipeline for the near-term and long-term developed condition, as shown on the Utilities Plan.

3.3.2 Discovery Bay Water System Connection

The Discovery Bay Community Services District (CSD) completed their water system Master Plan update in January 2012. Extending water service to the Airport was not anticipated in the Plan; however, the CSD does have capacity in their system to provide water for domestic and fire protection uses. In discussions with the CSD, sufficient capacity is currently available and the CSD would be open to discussions on serving the Airport. Since the Airport and pipeline route are outside of Discovery Bay's service boundaries, the connection would have to be approved by the Contra Costa Local Agency

Formation Commission (LAFCO). It is not known at this time if local residents or property owners along the pipeline route would support or oppose the project. In addition, it should be noted that the CSD's obligations may change, so there is no guarantee that there will be capacity in the future if/when the Airport would want to connect to the CSD system.

The assumption made for cost estimating purposes is that the Airport would be responsible for all costs associated with the connection to the Discovery Bay System, which is likely to include a water storage tank, pipelines, a water booster pump station, and easements. Refer to Appendix E for a map of a proposed alignment for a utility connection to Discovery Bay, and Appendix F for an on-site Utility Plan with a Discovery Bay connection. As shown on the Utility Plan, the domestic water and fire protection are combined in a single water main.

3.3.3 Byron Water System Connection

The community of Byron does not have a domestic water system. The residents primarily rely on individual domestic water wells. There is a small community water system with two wells located along Main Street, but the system has insufficient capacity to provide water to the Airport.

3.4 Opinion of Probable Construction Costs (OPCC)

A comparative opinion of probable construction costs (OPCC) was developed for the fire protection system improvements required to support future development. The OPCC only included the major construction components for each scenario. Unit costs were estimated using the RS Means Heavy Construction Cost Data Manual 2013, Contractor bids for related work, and discussions with Contractors/suppliers.

3.4.1 On-Site Improvements

An OPCC was prepared for extending the existing fire protection system to the near-term and long-term potential development areas. Since the existing fire pond and pump have the capacity to support the development areas, only pipeline extensions were required for the future areas. The OPCC's for the near-term and long-term development are provided below.

The near-term developments include extensions of the fire protection system to serve the development areas along the west side of Runway 12-30.

Near-Term Development On-Site Fire Protection Improvements

Description	Quantity	Unit Cost	Cost
12-Inch PVC Pipe	7,100 LF	$100	$710,000
12-Inch Gate Valve	16 EA	$2,500	$40,000
Fire Hydrant	16 EA	$5,700	$91,200
		Subtotal:	$841,200
		Contingency (25%):	$210,300
		Rounded Total:	***$1,050,000***

The long-term developments include extensions of the fire protection system to serve the development areas along the northeast side of Runway 12-30 and immediately north of Runway 5-23 to provide a looped system. The long-term improvements assume that the near-term improvements have already been constructed.

Long-Term Development On-Site Fire Protection Improvements

Description	Quantity	Unit Cost	Cost
12-Inch PVC Pipe	14,600 LF	$100	$1,460,000
12-Inch Gate Valve	12 EA	$2,500	$30,000
Fire Hydrant	30 EA	$5,700	$171,000
		Subtotal:	$1,661,000
		Contingency (25%):	$415,250
		Rounded Total:	***$2,080,000***

3.4.2 Connection to Discovery Bay

An OPCC was prepared connecting to the Discovery Bay water system for fire protection for the existing developed areas and the near-term and long-term potential development areas. The alternative included a transmission main from Discovery Bay, a water storage tank, and a booster pump station. The costs for the connection to Discover Bay would be included in the near-term development costs, and the long-term development OPCC only included on-site pipeline extensions to the development area since it is assumed that the water transmission from Discovery Bay, booster pump station, and water storage tank were already constructed for the near-term development area. The OPCC's for the near-term and long-term development are provided below. Since the size of a water transmission pipeline for a joint-use of fire protection and domestic water is governed by the fire flow demand, this alternative also includes providing domestic water service.

Near-Term Development Fire Protection Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe	26,000 LF	$80	$2,080,000
12-Inch PVC Pipe	7,100 LF	$100	$710,000
8-Inch Gate Valve	22 EA	$1,500	$33,000
12-Inch Gate Valve	16 EA	$2,500	$40,000
Fire Hydrant	16 EA	$5,700	$91,200
Booster Pump Station	1 EA	$120,000	$120,000
600,000 Gallon Water Storage Tank	1 EA	$750,000	$750,000
Utility Easement	12 AC	$8,000	$96,000
		Subtotal:	$3,920,200
		Contingency (25%):	$980,050
		Rounded Total:	**$4,900,000**

Long-Term Development Fire Protection Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
12-Inch PVC Pipe	14,600 LF	$100	$1,460,000
12-Inch Gate Valve	12 EA	$2,500	$30,000
Fire Hydrant	30 EA	$5,700	$171,000
		Subtotal:	$1,661,000
		Contingency (25%):	$415,250
		Rounded Total:	***$2,080,000***

4. Sanitary Sewer System

4.1 Existing Septic System

The Airport's sewer service is currently provided by approximately 2,500 LF of sanitary sewer collection mains and a 3,000-gallon underground septic tank with a lift station to a leach field that is located southwest of the main aircraft ramp. The lift station includes two 2-HP Hydromatic Submersible Sewage Grinder Pumps (model SPGL200M2-2) with a 46 gpm maximum capacity each.

4.1.1 Soil Application Rates

Based on the United States Department of Agriculture Natural Resources Conservation Service soils map, the soil in the Airport development area is typically Linne Clay Loam (LbD), San Ysidro Loam (Sc), and Solano Loam (Sk). The permeability of these soil types range from 0.2-0.6, 0.6-2.0, and 0.6-2.0 inches per hour, respectively. The geotechnical investigations conducted as part of the Byron Airport Engineer's Design Report showed near surface soil conditions of silty clay and sandy clay along Runway 12-30 which would correlate with an infiltration rate of 0.6. For this analysis, a conservative infiltration rate of 0.6 inches per hour was assumed, which equates to a percolation rate of 100 minutes per inch and a soil loading rate of 0.2 gallons per square feet per day[2].

4.2 Existing Septic System Capacity and Current Demand

The existing septic system capacity is limited to the capacity of the leach field. As shown in the as-built plans, the septic system leach field is approximately 8,600 square feet. With a soil loading rate of 0.2, the leach field has a capacity of 1,720 gallons per day (gpd).

The current septic system demand is low due to the few water users. The main water uses at the Airport include 7 sinks, 5 toilets, 3 urinals, and the aircraft wash rack. There are no restrooms located inside the Byron Jet Center; however, there are stubbed utilities for future connection to water and sewer service.

In order to estimate the peak sewage flow, the number of aircraft based at the Airport (112 aircraft) was multiplied by the estimated sewage flow for a service station (10 gpd[3]) and then multiplied by a factor of 60% since all aircraft are not expected to be maintained during a peak day. Therefore, the estimated peak daily sewage flow for the existing conditions is 672 gallons, or approximately 39% of the capacity.

The existing system does have capacity to support future development and can handle an additional 1,048 gpd. The extent of development that the system can handle would depend on the type of development. For example, the design flow for industrial warehouse type of uses is 25 gpd per 1,000 square feet (sf) of floor space, so additional development of 42,000 sf could be developed with the existing system capacity. Alternately, restroom facilities require approximately 5 gallons per person per day, so the existing system has sufficient capacity to support approximately 210 additional uses per day.

4.3 Sanitary Sewer System for Future Development

The sanitary sewer system analysis was based upon design flow criteria from the City of Oakland "Sanitary Sewer Design Standards," which lists an average wastewater generation rate of 25 gpd/1,000 sf of building area for bulk and transload warehouse types of construction. The Central Contra Costa Sanitary District's Collection System Master Plan Update lists a wastewater generation rate of 1,000 gpd/acre based on lot size for an industrial type of development. For this analysis, the sanitary sewer system utilizes the City of Oakland wastewater generation flows as the warehouse type of development is more applicable. It was assumed that approximately 60% of the developable land area would be developed into building footprints. The assumption included an approximate 20% of developable land utilized for both parking and greenspace. The table below summarizes the short and long term anticipated wastewater generation rates.

---

[2] Percolation Rates and Soil Loading Rates are from Appendix 2 of the Contra Costa Health Services Health Officer Regulations Chapter 420-6.

Land Use Category	Area (acres)	Developed Area (x1,000 sf)	Wastewater Flows (gpd)
Short-term development	55.4	1,450	36,250
Long-term development	91.5	2,390	59,750
Total	**146.9**	**3,840**	**96,000**

4.3.1 On-Site Expanded Sewage Leach Fields

The near-term development is estimated to require a minimum 28,400 gallon septic tank and 4.2 acres of leach field. The long-term development is estimated to require an additional minimum 46,000 gallon septic tank and 6.9 acres of leach field. Large leach fields of these sizes are typically not used due to the high initial construction and operations and maintenance cost, so several smaller leach fields would be required to support the development.

The on-site handling of the potential near-term and long-term development is not feasible at a centralized location given limitations on leach field sizing. However, septic systems with leach fields would be feasible as separate systems at each development site. Requiring each development to construct individual septic systems would eliminate the need for sanitary sewer piping within the Airport, but would reduce developable acreage, increase permitting requirements, and increase construction and operations and maintenance (O&M) costs for the developments.

4.3.2 On-Site Sewage Treatment

On-site treatment is feasible with a package wastewater treatment plant. There are a number of manufacturers of packaged wastewater treatment plants that would meet the Airport's treatment needs for both short term and long term development. The treatment plant would be permitted through the Regional Water Quality Control Board (RWQCB) General Order 97-10. The treatment plants are available in both above ground and partially underground models and with a wide range of flow rates. A package wastewater treatment plant would include the following components and processes:

- Influent equalization chamber
- Sludge holding chamber/aerobic digester
- Aeration chamber
- Clarifier
- Filter Equipment (for irrigation discharges)
- UV Disinfection

One issue with on-site treatment is the disposal of the treated effluent. The effluent can be treated to meet California Title 22 requirements which would allow for the treated effluent to be used for landscape irrigation.

Permitting a new treatment plant is a lengthy process as the RWQCB prefers regionalization of sewage treatment. One factor that will work in favor of permitting the use of a package treatment plant is that the

Airport is not in proximity to a regional wastewater treatment facility that has sufficient capacity; therefore the RWQCB would be more likely to approve a new treatment plant.

A package sewage treatment plant does require ongoing O&M costs, primarily for labor and electricity usage. The Airport could perform O&M wastewater treatment activities with the proper certifications or could contract for the O&M services. The RWQCB requires regular reporting of the plant operation. For planning purposes, we estimate that the plant would require the following O&M expenses:

1. Electricity - 25 HP x 0.735 KW/HP x 24 hrs/day x 365 days/year x $0.12/KWH = $19,300/year
2. Labor (operation requires 1 man hr/day) - $40/hour x 365 hours/year = $14,600/year
3. Replacement (typically 2% of equipment cost annually) - $375,000 x 2% = $7,500/year
4. Chemicals - $0 for UV disinfection
   Total O&M cost is estimated at $41,400 per year

4.3.3 Discovery Bay Sewer System Connection

The Town of Discovery Bay CSD was formed in July 1998 with the responsibility to provide water and wastewater services to the Discovery Bay community. The CSD recently completed their sanitary sewer Master Plan in February 2012 and providing sewage service to the Airport was not anticipated in the Plan. In discussions with the CSD, sufficient capacity is available and the CSD would be open to discussions on serving the Airport. Since the Airport and sewage forcemain route are outside of Discovery Bay's service boundaries, the connection would have to be approved by the Contra Costa LAFCO. It is not known at this time if local residents or property owners along the pipeline route would support or oppose the project.

The assumption made for cost estimating purposes is that the Airport would be responsible for all costs associated with the connection to the Discovery Bay System, which is likely to include modifications to the existing sewage lift station (or a new lift station) and a forcemain to Discovery Bay. There may also be a connection fee to join the CSD; however, a connection fee cannot be negotiated until a firm plan and construction timeline is developed. Refer to Appendix E for a map of a proposed alignment for a potential connection to Discovery Bay, and Appendix F for an on-site Utility Plan with a Discovery Bay connection.

4.3.4 Byron Sewer System Connection

The Byron Sanitary District operates the Waste Water Treatment Facility (WWTF) for the community of Byron. The WWTF is permitted for a sewage flow of 96,000 gpd and is currently operated at approximately 56,000 gpd. The District has indicated that the Airport could connect to the WWTF, but a major expansion would be required to handle the estimated flow from the full development of the Airport. The WWTF needs to retain sufficient spare capacity to allow for increased flows from the Byron community and the fully developed sewage flow from the Airport exceeds the remaining WWTF treatment capacity.

Since the Airport and sanitary sewer forcemain route are outside of Byron's service boundaries, the connection would have to be approved by the Contra Costa LAFCO. Given the costs associated with expansion of the Byron WWTF and forcemain construction, this is not considered a viable option for sewage handling for the Airport development.

4.4 Opinion of Probable Construction Costs (OPCC)

A comparative OPCC was developed for the potential improvements required to support future development. The OPCC only included the major construction components for each scenario. Unit costs were estimated using the RS Means Heavy Construction Cost Data Manual 2013, Contractor bids for related work, and discussions with Contractors/suppliers.

4.4.1 On-Site Improvements

An OPCC was prepared for providing sewer service to the near-term and long-term potential development areas. Since the existing sewer lift station and leach field cannot support the full future development, the OPCC includes a sewer pipeline and a sewer lift station. A separate sewer system would be required for the near-term and long-term development areas due to the size of the leach field. The OPCC's for the near-term and long-term development are provided below. The long-term improvements assume that the near-term improvements have already been constructed.

Near-Term Development On-Site Sewer System Improvements

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe	3,600 LF	$50	$180,000
4-Foot Sewer Manholes	9 EA	$3,200	$28,800
30,000 Gallon Tank	1 EA	$60,000	$60,000
Leach Field (total acreage)	4.2 AC	$250,000	$1,050,000
Sewer Lift Station	1 EA	$80,000	$80,000
		Subtotal:	$1,398,800
		Contingency (25%):	$349,700
		Rounded Total:	***$1,750,000***

Long-Term Development On-Site Sewer System Improvements

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe	11,100 LF	$50	$555,000
4-Foot Sewer Manholes	28 EA	$3,200	$89,600
50,000 Gallon Tank	1 EA	$75,000	$75,000
Leach Field (total acreage)	6.9 AC	$250,000	$1,725,000
Sewer Lift Station	1 EA	$80,000	$80,000
		Subtotal:	$2,444,600
		Contingency (25%):	$611,150
		Rounded Total:	***$3,050,000***

4.4.2 On-Site Sewage Treatment Improvements

An OPCC was prepared for providing sewer service for the near-term and long-term potential development areas. Since the existing sewer lift station cannot support the full future development, the OPCC includes a sewer pipeline and a sewer lift station. The costs include a budgetary estimate of the package wastewater treatment plant required for both the short-term and long-term development. However, it is recommended that the Airport install the package wastewater treatment plant for the full build-out (near-term plus long-term development) initially due to permitting and site constraints. A package treatment plant with a capacity for the near-term usage only would be recommended only if the long-term development were determined to be indefinitely delayed behind the near-term development. The OPCC's for the near-term and long-term development are provided below. The long-term improvements assume that the near-term improvements have already been constructed.

Near-Term Development On-Site Sewer System Improvements (Smaller Treatment Plant)

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe	3,600 LF	$50	$180,000
4-Foot Sewer Manholes	9 EA	$3,200	$28,800
Site Preparation	1 EA	$120,000	$120,000
Treatment Plant	1 EA	$425,000	$425,000
Sewer Lift Station	1 EA	$80,000	$80,000
Effluent Irrigation Piping	2,000 LF	$25	$50,000
		Subtotal:	$883,800
		Contingency (25%):	$220,950
		Rounded Total:	***$1,100,000***

The treatment plant required for full build-out development is recommended to be installed with the near-term development, which would add $595,000 to the near-term cost for a total of **$1,695,000.**

Long-Term Development On-Site Sewer System Improvements

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe	11,100 LF	$50	$555,000
4-Foot Sewer Manholes	28 EA	$3,200	$89,600
Site Preparation	1 EA	$120,000	$1120,000
Treatment Plant	1 EA	$900,000	$900,000
Sewer Lift Station	1 EA	$80,000	$80,000
Effluent Irrigation Piping	2,000 LF	$25	$50,000
		Subtotal:	$1,794,600
		Contingency (25%):	$448,650
		Rounded Total:	***$2,240,000***

The long-term development costs are reduced by $1,375,000 to **$865,000** if the full build-out treatment plant required is constructed as part of the near-term development. The long-term costs would include pipe extensions to connect to the long-term development areas.

4.4.3 Connection to Discover Bay

An OPCC was prepared for delivering sewage flow to Discovery Bay for the existing developed areas and the near-term and long-term potential development areas. The alternative includes modifications to the existing sewer lift station and a forcemain to Discovery Bay with capacity for the near-term and long-term development. The OPCC does not include any connection fees that may be required by Discovery Bay, or any allowances for obtaining utility easements or environmental mitigation. The OPCC is provided below.

Near-Term Development Sewer System Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe (On-Site)	3,600 LF	$50	$180,000
4-Inch PVC Pipe (to Discovery Bay)	26,000 LF	$35	$910,000
4-Foot Sewer Manholes (On-Site)	9 EA	$3,200	$28,800
Sewer Lift Station	1 EA	$150,000	$150,000
Utility Easements	12 AC	$8,000	$96,000
		Subtotal:	$1,364,800
		Contingency (25%):	$341,200
		Rounded Total:	***$1,710,000***

Long-Term Development Sewer System Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
8-Inch PVC Pipe (On-Site)	11,100 LF	$50	$555,000
4-Foot Sewer Manholes (On-Site)	28 EA	$3,200	$89,600
		Subtotal:	$644,600
		Contingency (25%):	$161,150
		Rounded Total:	***$810,000***

5. Domestic Water System

The domestic water system analysis was based upon design flow criteria stated in the Central Contra Costa Sanitary District's Collection System Master Plan Update. Typically, sanitary sewer design flow is approximately 70% of the domestic water design flow. However, since the domestic water design flow usually includes irrigation, minor losses, and fire protection (fire protection is a separate service for the Airport), it was concluded that a 1:1 ratio between domestic water and sanitary sewer design flows would be appropriate.

For this analysis, the domestic water system conservatively assumed the entire developable area would be converted to Industrial uses. The design flow used in the analysis was 25 gpd per 1,000 sf of developed building footprint.

5.1 Existing Domestic Water System

The existing domestic water system consists of a groundwater well with a 4,000 gallon holding tank. The domestic water system includes a booster pump and chlorination system. The domestic water system is non-potable and is not used for fire protection.

The groundwater well was drilled and installed by Dejesus Pump and Well Drilling, Inc. (Dejesus Pump) in September 1994. The well is 200 feet deep and consists of a 6-inch diameter plastic casing placed inside a 12.25-inch diameter bore hole. The well casing is screened from 50-70 feet and 180-200 feet below ground surface, with the remaining casing blank. The annular space in the upper 50 feet was filled with cement and the remaining 150 feet was filled with 0.25 inch gravel. The Well Completion Report is included in Appendix G.

The domestic water system includes a 2-inch diameter pipeline extending from the well to the northwest, parallel to the taxiway and past the hangars to the Byron Jet Center. The existing water system pipeline is shown on the Utilities Plan in Appendix D.

5.2 Existing Domestic Water System Capacity

The groundwater well production has significantly decreased since it was developed, and the County estimates it pumps approximately 40-60 gallons per hour. There have been instances where a faucet was accidentally left on or a toilet continued to run causing the tank to drawdown and the well pump to run continuously. The Airport has had to fill the tank by hauling water from off-site sources.

The existing domestic water system capacity was based on the California Department of Public Health regulations, specifically Section §64554 of the California Waterworks Standards (CWS) Title 22, Chapter 16, California Code of Regulations, CCR. The CWS states that the system shall meet at least 4 hours of peak hourly demand (PHD) through source supply, storage, and emergency source connections. The PHD of the existing system is conservatively 520 gallons per hour, based upon the area of the existing facilities. At current water demands, the tank will deliver 2,080 gallons during four hours of PHD. The supply to the tank, based on the well pump estimates, will fill 160 gallons in 4 hours. Thus, the current operational storage volume is 1,920 gallons (2,080 gallons minus 160 gallons). Since the existing domestic water system utilizes a 4,000 gallon tank, the current water system is at approximately 48% capacity.

The existing domestic water tank has capacity to support future development and can provide an additional 2,080 gallons of water over a 4-hour period of peak hourly demand, or approximately 560 gallons per hour, provided that there is an adequate supply from the well. The extent of development the system can handle would depend on the type of development at the Airport.

5.3 Domestic Water System for Potential Development

The development of the Airport would require a significant amount of domestic water, which would need to be potable to support the various users. Based on the areas reserved for potential development, the water design flow would be 36,250 gpd and 59,750 gpd for near-term and long-term development, respectively, based on an industrial demand of 25 gpd per 1,000 sf of building footprint within the developable area. The full build-out demand of water for domestic uses is projected to be 96,000 gpd.

5.3.1 On-Site Water System

Based on a review of nearby groundwater wells and conversations with Dejesus Pump, there is a low probability of locating a groundwater source in the area with the supply and water quality needed to support the future development. The stratigraphy in the area changes quickly over a short area, so the presence of a quality aquifer similar to the supply for the nearby Discovery Bay wells is not likely. Water quality tests taken at the location of the existing well prior to development indicated that the water contains about 13,000 mg/l of total dissolved solids, and water of this high concentration is considered not drinkable. A potential location for a water source could be near the Byron Hot Springs, but there is also a high possibility for salt in this source. Another location for a new well may be the area north of Runway 12-30 towards Armstrong Road instead of the current location to the west of the intersection of the two runways.

To determine the availability of groundwater to supply the development at the Airport, a few test wells should be drilled as part of the decision process on how to move forward on water supply. Test well locations need to be based on a review of nearby groundwater wells. The test wells would be pumped to establish the reliable quantity of water available and also tested for water quality to establish the treatment requirements needed to treat the water for potable uses.

The groundwater aquifers in the area are expected to be low yielding (approximately 10 gpm), so more than one groundwater well would likely be required to provide adequate water for the future development. The build-out demand for domestic water is approximately 70 gpm. However, for cost estimating purposes, groundwater conditions supporting a yield of approximately 40 gpm was assumed and two wells were included in the OPCC (one well for near-term and one well for long-term development). It should be noted that if a high yielding aquifer is not located, constructing a series of multiple low-yielding wells (5 or more) is not cost effective and another source of water should be considered.

If on-site water sources are identified, an option for water treatment would be to install a Z-Box Packaged Treatment Plant manufactured by GE. The GE treatment plants are pre-engineered systems that are cost effective and compact solutions for potable water treatment. The packaged system uses an ultrafiltration membrane which effectively blocks particles, bacteria, viruses and cysts from water supplies. The system was designed with an expandable setup, so the system can be installed with a single membrane tank (up to 100,000 gpd capacity) for the near-term development, and expanded with an additional membrane tank for the long-term development, if necessary. The Z-Box S Packaged Plant has a maximum capacity of 400,000 gpd, so it has the capability to be expanded beyond the expected near-term and long-term development needs. The Z-Box S Packaged Plant with two membrane tanks (200,000 gpd capacity) would require a space approximately 16-feet long by 8-feet wide, and approximately 6-feet tall. The Z-Box S Packaged Plant is included in the OPCC for on-site water improvements below. However, it should be noted that the Z-Box Packaged Treatment Plant will require continual O&M activities. For planning purposes, we estimate that the plant would require the following O&M expenses:

1. Electricity - 20 HP x 0.735 KW/HP x 24 hrs/day x 365 days/year x $0.12/KWH = $15,400/year
2. Labor - (operation requires 1 man/hr/day) $40/hour x 365 hours/year = $14,600/year
3. Replacement - (typically 10% of membrane replacement cost) $25,000 x 2% = $2,500/year
4. Chemicals - $0 for UV disinfection

   Total O&M cost is estimated at $32,500 per year

5.3.2 Discovery Bay Water System Connection

The Discovery Bay CSD recently completed their water services Master Plan in 2012 and an Airport connection was not anticipated in the Plans; however, the facilities do have capacity to provide water for domestic and fire protection uses. It should be noted that the capacity may not be available in the future, depending on development within the CSD boundaries and timing of Airport development.

For cost estimating purposes, it was assumed that the Airport would be responsible for all costs associated with the connection to the Discovery Bay System, which is likely to include a water storage tank, pipelines, and a water booster pump station. Discovery Bay may also charge a connection fee for connecting to the system. A budgetary cost estimate for the fee is not available and would be negotiated at the time of application to the CSD. The connection would have to be approved by the Contra Costa LAFCO, as described above under the fire protection discussion. Refer to Appendix E for a map of a proposed alignment for a utility connection to Discovery Bay.

5.3.3 Byron Bethany Irrigation District Water Supply

The Byron Bethany Irrigation District (BBID) provides untreated water to the Byron area from March to October, dependent upon irrigation demands. The BBID has indicated they have the ability to supply water to the Airport year-round, and is serving the Mountain House development in a similar arrangement. BBID owns a 20-million-gallon per day (MGD) pumping plant along the California Aqueduct which pumps water to the Mountain House water treatment plant through a water main. The water treatment plant is currently operating at 15 MGD, with full build-out of 20 MGD. The pumps within the pumping plant could be improved by including a variable frequency drive, or potentially installing a new small pump along with connecting piping and valving to supply the Airport. The BBID pumping plant is located approximately 2 miles from the Airport. The water would require treatment from a packaged water treatment plant such as the Z-Box system described above.

Two options are available to convey water from BBID to the Airport: (1) utilize the existing irrigation canal, or (2) construct a pipeline. The use of BBID irrigation water for potable uses would require a sanitary survey and would have to be approved by the State Department of Health Services (DHS). Since the open canal has the potential for contamination from surface runoff, grazing livestock, or vandalism, it can be foreseen that the DHS would not be favorable to this alternative. Therefore, this alternative will include a new buried pipeline to deliver water to the Airport. Refer to Appendix H for a map of a proposed alignment for a water conveyance facility to the Airport from the BBID pumping plant

BBID water would require treatment for potable uses. The Z-Box packaged treatment plant discussed above would be required to treat the water for potable use. The treatment plant could be operated and maintained by the Airport, or the BBID could operate the treatment facility. In addition, the water system would require a booster pump and water storage tank. The water storage tank would be sized at 100,000 gallons, which is the average day demand at full build-out development.

5.3.4 Combination Domestic Water Supply and Fire Protection

A permanent water supply connection to BBID or Discovery Bay would allow the Airport to utilize the supply for both domestic uses and fire protection and eliminate the need for the fire pond and fire pump.

Utilizing water from Discovery Bay for fire protection in addition to domestic uses is feasible. The domestic water and fire protection water could utilize a common pipe, similar to municipal water systems because the water is treated by Discovery Bay.

A storage tank and booster pump station would need to be sized to provide the flows and volume of water required for firefighting in addition to the domestic water requirements. The water storage tank would require a storage volume of 600,000 gallons and the booster pump station would need a capacity of 3,070 gpm. The water system is required to have sufficient capacity to deliver the fire flow and the domestic uses simultaneously, 3,000 gpm for fire flow and 70 gpm for domestic uses. The water storage tank would have several days of water storage under normal usage conditions. Chlorine may need to be added to the water storage tank to maintain the minimum level required for disinfection.

Utilizing water from a BBID domestic water pipeline for both domestic water supply and fire protection would be feasible, but more expensive. The additional supply required for fire protection would require more extensive pump upgrades in the BBID pump station.

The fire protection system would continue to utilize a separate pipeline to avoid having to treat the water used for fire protection. A common system for both fire protection and domestic water uses would require sizing the treatment plant to accommodate the fire flows at 3,000 gpm, which would be a significantly more expensive plant. A common system would also limit the available water for firefighting to the treatment plant's capacity and storage volume. Currently, there is no limit on available water during irrigation season.

Utilizing a new BBID supply for both fire protection and domestic supply would require the following:

- Significant upgrades to the BBID pump station
- Two water storage tanks for fire protection and treated domestic water
- Two booster pump stations for fire protection and domestic water
- Separate pipelines

5.4 Opinion of Probable Construction Costs (OPCC)

A comparative OPCC was developed for the potential improvements required to support future development. The OPCC only included the major construction components for each scenario. Unit costs were estimated using the RS Means Heavy Construction Cost Data Manual 2013, Contractor bids for related work, and discussions with Contractors/suppliers.

5.4.1 On-Site Improvements

An OPCC was prepared for providing domestic water service to the near-term and long-term potential development areas. Since the existing domestic water well and tank cannot support the near-term or long-term future development, the OPCC includes the drilling of a new well, a new storage tank, a new water treatment facility, and water pipeline to the on-site development areas. A separate water system was included to support the long-term development areas. The OPCC's for the near-term and long-term development are provided below. The long-term improvements assume that the near-term improvements have already been constructed.

Near-Term Development On-Site Domestic Water Improvements

Description	Quantity	Unit Cost	Cost
Drill Water Well	1 EA	$350,000	$350,000
20,000 Gallon Storage Tank	1 EA	$30,000	$30,000
Water Treatment Facility	1 EA	$200,000	$200,000
4-Inch Diameter PVC Pipe	3,200 LF	$35	$112,000
4-Inch Valves	6 EA	$700	$4,200
		Subtotal:	$696,200
		Contingency (25%):	$174,050
		Rounded Total:	***$870,000***

Long-Term Development On-Site Domestic Water Improvements

Description	Quantity	Unit Cost	Cost
Drill Water Well	1 EA	$350,000	$350,000
20,000 Gallon Storage Tank	1 EA	$30,000	$30,000
Water Treatment Facility Add-on	1 EA	$100,000	$100,000
4-Inch Diameter PVC Pipe	11,400 LF	$35	$399,000
4-Inch Diameter Valves	24	$700	$16,800
		Subtotal:	$895,800
		Contingency (25%):	$223,950
		Rounded Total:	***$1,120,000***

The well cost estimate takes into account the probability that test wells and additional measures would need to be included to site and develop the well to produce and adequate water supply. The cost estimate includes the following:

- Test wells and test pumping to locate optimum well site
- Well development
- Well casing, piping, pump and motor, and connection to water system
- Electrical supply and controls

5.4.2 Connection to Discover Bay

An OPCC was prepared for providing water for domestic uses from Discovery Bay for the existing developed areas and the near-term and long-term potential development areas. This scenario assumes that fire protection would be handled by the on-site system. The alternative included a transmission main from Discovery Bay and on-site booster pump station, water storage tank, and piping. The OPCC does not include any connection fees that may be required by Discovery Bay, or any allowances for environmental mitigation. The OPCC's for the Discovery Bay connection, booster pump station, and water storage tank would need to be constructed in the near-term.

Near-Term Development Domestic Water Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
8-Inch Diameter C900 PVC Pipe	26,000 LF	$80	$2,080,000
8-Inch Diameter Valves	55 EA	$1500	$82,500
Booster Pump Station	1 EA	$120,000	$120,000
100,000 Gallon Water Storage tank	1 EA	$130,000	$130,000
Utility Easements	12 AC	$8,000	$96,000
4-Inch Diameter PVC Pipe (On-Site)	3,200 LF	$35	$112,000
4-Inch Valves (On-Site)	6 EA	$700	$4,200
		Subtotal:	$2,624,700
		Contingency (25%):	$656,175
		Rounded Total:	***$3,280,000***

Long-Term Development Domestic Water Connection to Discovery Bay

Description	Quantity	Unit Cost	Cost
4-Inch Diameter PVC Pipe (On-Site)	11,400 LF	$35	$399,000
4-Inch Valves (On-Site)	24 EA	$700	$16,800
		Subtotal:	$415,800
		Contingency (25%):	$103,950
		Rounded Total:	***$520,000***

5.4.1 Connection to BBID

An OPCC was prepared for providing water for domestic uses from BBID for the existing developed areas and the near-term and long-term potential development areas. This scenario assumes that fire protection would be handled by the existing on-site system. The alternative included a transmission main from BBID and on-site pipe extensions to the potential development areas. The OPCC does not include any connection fees that may be required by BBID, or any allowances for obtaining utility easements or environmental mitigation. The pipeline route is located primarily on Airport property or within BBID property. The pipeline route located on Airport property is largely within the areas designated as the Biologically Sensitive Area and would need to be permitted. It is anticipated that the water transmission from BBID, package water treatment plant, storage tank, and booster pump station would be constructed for the near-term development area. The OPCCs for connection to BBID are provided below. The BBID connection, booster pump station, and water storage tank would need to be constructed for the near-term development.

Near-Term Development Domestic Water Connection to BBID

Description	Quantity	Unit Cost	Cost
8-Inch Diameter C900 PVC pipe	7,500 LF	$80	$600,000
8-Inch Diameter Valves	15 LF	$700	$10,500
100,000 Gallon Water Storage Tank	1 EA	$130,000	$130,000
Booster Pump Station	1 EA	$120,000	$120,000
Water Treatment Facility	1 EA	$200,000	$200,000
Site Preparation Work	1 EA	$80,000	$80,000
BBID Pumping Plant Improvements	1 EA	$75,000	$75,000
4-Inch Diameter PVC Pipe (On-Site)	3,200 LF	$35	$112,000
4-Inch Valves (On-Site)	6 EA	$700	$4,200
		Subtotal:	$1,331,700
		Contingency (25%):	$332,925
		Rounded Total:	***$1,660,000***

Long-Term Development Domestic Water Connection to BBID

Description	Quantity	Unit Cost	Cost
4-Inch Diameter PVC Pipe (On-Site)	11,400 LF	$35	$399,000
4-Inch Valves (On-Site)	24 EA	$700	$16,800
		Subtotal:	$415,800
		Contingency (25%):	$103,950
		Rounded Total:	***$520,000***

6. Private Utilities

Telephone and electric service is provided to the Airport. Both of these utilities are routed to the Airport from the intersection of Holey Road and Byron Hot Springs Road. The utility lines cross beneath the runway and taxiway to the Administration Building. No television or natural gas services are provided to the airport; however, several empty conduits are installed under the runway and taxiway to allow for future utilities.

6.1 Electrical Service

The electrical service to the Airport is provided by the Pacific Gas and Electric Company (PG&E). The existing service is delivered by a 12-kilovolt line, which is sufficient to supply power to the future development at the Airport discussed in this report.

6.2 Natural Gas Service

There is currently no natural gas service provided to the Airport. However, there is a PG&E high pressure transmission line that crosses Runway 5-23. PG&E doesn't foresee any issues with extending natural gas service to the Airport; however, the final determination cannot be made until a formal service request has been submitted.

6.3 Communication Service

The communication service to the Airport is currently provided by AT&T through underground lines. Telecommunications, video/television, and data services can be added to the Airport to serve future development. There is an existing fiber-optic line along Byron Highway, which can be extended to the Airport's demarcation point and then wired throughout the Airport property to the individual users. The Airport would have to submit a service request to AT&T describing the types of services to be added at the Airport property.

6.4 State Route 239 TriLink Program

First identified in 1959, SR-239 is a legislatively approved, but unconstructed route in the California state highway system. SR-239 is a potential multimodal link between SR-4 near Brentwood and I-205 west of Tracy in San Joaquin County. The route has not been adopted by the California Transportation Commission; however, Contra Costa County was awarded $14 million for initial study and planning under SAFETEA-LU in 2005. Administration of the study, now called TriLink, was transferred to the Contra Costa Transportation Authority in January 2012. The Parsons Transportation Group is working on the project and is performing a study to identify ways to improve transportation in the area.

The TriLink project study currently includes a connector link to the Byron Airport, which could improve access to the airport and potential future airport development. In addition, the TriLink project includes utility planning, which could potentially be extended to serve the airport. However, at this time the TriLink feasibility analysis is too premature to include in the report.

7. Storm Water System

7.1 Existing Infrastructure

The existing storm water system includes a combination of storm drainage pipes and ditches to convey water to the detention pond. Along Runway 12-30, storm drainage pipes convey water to the northeast side of the runway to a parallel drainage ditch. The drainage ditch flows southeast to the detention pond. The storm water from the existing development west of the runway is conveyed through pipes and is connected to the piping beneath the runway and to the drainage ditch. Along Runway 5-23, storm drainage pipes convey water to the south side of the runway to a parallel drainage ditch. The drainage ditch flows easterly to the detention pond. The storm drainage facilities were designed for a 10-year storm event.

The existing storm water detention pond east of Runway 5-23 has an area of approximately 15 acres. The existing pond was designed to reduce the peak storm water flows of the pre-development condition at the Airport for the 3-, 6-, and 12-hour storm duration for a 10-, 25-, 50-, and 100-year storm event. The storm water discharges from the property into the roadside ditch along Holey Road. The storm water flows east along Holey Road to Byron Highway and then north along Byron Highway to a ditch which flows into Italian Slough.

7.2 Storm Water Infrastructure for Future Development

The storm water infrastructure improvements required to serve the near-term and long-term future development were evaluated to meet the requirements of the Contra Costa Clean Water Program (CCCWP): *Stormwater C.3 Guidebook*, 6th Edition. The Guidebook requires both flow control and water quality control to be incorporated into the storm water facilities.

The CCCWP recommends working with the County and utilizing the USEPA Hydrologic Simulation Program-Fortran (HSPF) model to simulate flows for a 30-year period. Given the preliminary nature of the planned developments, we utilized an alternative modeling approach (the Rational Method) for both flow control and water quality control, which meet CCCWP requirements. The Rational Method is more of a generalized or programmatic approach to detention pond sizing. The C.3 Guidebook stipulates that the basin should be sized to detain 80% of the total runoff during the simulation period. As the development plan becomes more focused, the Airport would begin preparing a Storm Water Master Plan and consulting with the CCCWP on modeling the proposed developments with the HSPF model.

In sizing the detention pond, it was assumed that all storm water would be treated at the detention pond. Low Impact Design (LID) features on the individual development areas were not included. As part of the future development, various on-site LID features may be required on individual sites, which would reduce the required size of the detention pond. The lands north and east of the existing pond could be utilized to expand the pond to support the future development. The existing pond could also be modified to meet the storm water requirements for the existing airport and future development, but for the purposes of this evaluation, new detention capacity constructed adjacent to the existing pond was considered in order to be conservative in cost estimating.

The storm water conveyance system for future development was preliminarily designed using concrete pipes to convey the storm water to the detention pond. The storm pipe sizing is based on a 10-year storm. It may be feasible to utilize the existing ditches parallel to the two runways to convey storm water from the development areas. The capacity of the ditches would need to be evaluated to determine if they could support the additional flows. For the purposes of this evaluation and to be conservative in cost estimating, storm drainage pipes were considered.

7.2.1 Near-Term Storm Water Improvements

The near-term storm water improvements include an expansion of the detention pond, water conveyance pipes, and storm drainage inlets. The detention pond volume required for the near-term development is approximately 1.8 acre-feet. For estimating purposes, detention pond dimensions of 360 feet long, 108 feet wide, and 2 feet deep were assumed. A concrete broad crested weir for outlet control was also included. The storm water conveyance for the development area southwest of Runway 12-30 includes approximately 5,600 LF of 18-inch and 24-inch diameter pipe and 14 drainage inlets/manholes. The storm water conveyance for the development north of Runway 5-23 includes approximately 2,600 LF of 12-inch diameter pipe and 7 drainage inlets/manholes.

7.2.2 Long-Term Storm Water Improvements

The long-term storm water improvements include expansion of the detention pond in addition to the expansion required for the near-term development. Conveyance pipes and storm drainage inlets would be extended to serve the development areas. The detention pond volume required for the long-term development is approximately 2.2 acre-feet. For estimating purposes, detention pond dimensions of 400 feet long, 120 feet wide, and 2 feet deep were assumed. A concrete broad crested weir for outlet control was also included. The storm water conveyance for the development area northeast of Runway 12-30 includes approximately 5,400 LF of 18-inch diameter pipe and 13 drainage inlets/manholes.

7.3 Opinion of Probable Construction Costs (OPCC)

An OPCC was developed for the storm water system improvements required to support future development. The OPCC only included the major construction components. Unit costs were estimated using the RS Means Heavy Construction Cost Data Manual 2013, Contractor bids for related work, and discussions with Contractors/suppliers.

7.3.1 On-Site Improvements

An OPCC was prepared for extending the existing storm water system to the near-term and long-term potential development areas. The OPCC's for the near-term and long-term development are provided below.

The near-term developments include extensions of the storm water system to serve the development areas along the west side of Runway 12-30.

Near-Term Development On-Site Storm Water System Improvements

Description	Quantity	Unit Cost	Cost
12-Inch Reinforced Concrete Pipe (RCP)	2,600 LF	$48	$124,800
18-Inch RCP	2,800 LF	$70	$196,000
24-Inch RCP	2,800 LF	$100	$280,000
Drain Inlet	21 EA	$3,200	$67,200
Detention Basin Excavation	78,000 CY	$8	$624,000
Outlet Control Structure	1 LS	$15,000	$15,000
		Subtotal:	$1,307,000
		Contingency (25%):	$326,750
		Rounded Total:	***$1,630,000***

The long-term developments include extensions of the storm water system to serve the development areas along the northeast side of Runway 12-30 and immediately north of Runway 5-23. The long-term improvements assume that the near-term improvements have already been constructed.

Long-Term Development On-Site Storm Water System Improvements

Description	Quantity	Unit Cost	Cost
18-Inch RCP	5,400 LF	$70	$378,000
Drain Inlet	13 EA	$3,200	$41,600
Detention Basin Excavation	96,000 CY	$8	$768,000
Outlet Control Structure	1 LS	$15,000	$15,000
		Subtotal:	$1,202,600
		Contingency (25%):	$300,650
		Rounded Total:	***$1,500,000***

8. Recommendations

8.1 Existing Infrastructure

The existing fire protection system is adequate for the current usage at the Airport. The fire protection system meets current code requirements and has adequate firefighting capacity when the pond is full and during the operating season of the Byron-Bethany Canal. The nearly one million gallons of stored water in the 96-inch diameter pipeline and the supplemental pump provide sufficient backup supply outside of irrigation season. The on-going O&M activities should continue in order to maximize the life of the system. No upgrades are recommended for the fire protection system for the existing conditions at the Airport.

The existing sanitary sewage system is currently functioning adequately and has approximately 1,000 gpd of remaining capacity. Leach fields typically have a limited useful life, approximately 15-20 years depending on usage. At some point, the leach field will need to be replaced, even without additional development. There is a reserve area established adjacent to the existing leach field. Since the existing system is near the typical useful life cycle for septic systems, the system should continue to be monitored and inspected to identify potential problems. No septic system upgrades are recommended for the existing conditions at the Airport.

The existing domestic water system is not currently functioning adequately. The groundwater well has been losing productivity and does not provide sufficient flow for current uses. The quality of the groundwater is also poor and the water is considered non-potable due to high levels of total dissolved solids. Rehabilitating the well may increase the production, but based on discussions with Dejesus Pump, it appears that the well is not located in a productive aquifer. We recommend that the Airport conduct test wells to identify a better location for a new groundwater well as described in Section 5. The domestic water tank is sufficient to support the existing infrastructure and has the capacity to support minimal additional uses.

8.2 Near-Term and Long-Term Development Options Summary

The table below summarizes the near-term and long-term development options for the Airport. The costs are in 2013 dollars and are taken from the tables above.

Utility	Alternative Description	Near-Term OPCC	Long-Term OPCC	Total Build-out OPCC	Annual O&M Cost
Fire Protection	Expand the Existing Fire Protection System	$1,050,000	$2,080,000	$3,130,000	Not evaluated
Fire Protection	Connect to Discovery Bay (includes Domestic Water)	$4,900,000	$2,080,000	$6,980,000	Not evaluated

Utility	Alternative Description	Near-Term OPCC	Long-Term OPCC	Total Build-out OPCC	Annual O&M Cost
Sanitary Sewer	On-site Septic System	$1,750,000	$3,050,000	$4,800,000	Not evaluated
Sanitary Sewer	On-site Water Treatment Plant (WTP constructed in each phase)	$1,100,000	$2,240,000	$3,340,000	$41,400
Sanitary Sewer	On-site Water Treatment Plant (full WTP constructed in Near-Term)	$1,695,000	$865,000	$2,560,000	$41,400
Sanitary Sewer	Connect to Discovery Bay	$1,710,000	$810,000	$2,520,000	Not evaluated

Utility	Alternative Description	Near-Term OPCC	Long-Term OPCC	Total Build-out OPCC	Annual O&M Cost
Domestic Water	On-site water wells with Water Treatment Plant	$870,000	$1,120,000	$1,990,000	$32,500
Domestic Water	Connect to Discovery Bay (Domestic Water Only; Fire Protection handled on-site)	$3,280,000	$520,000	$3,800,000	Not evaluated
Domestic Water	Byron Bethany Irrigation District (Domestic Water Only; Fire Protection handled on-site)	$1,660,000	$520,000	$2,180,000	$32,500

8.3 Fire Protection for Future Development

The fire protection system was modeled to extend water pipelines to the near-term and long-term development areas. With the water pipeline extended to the full build-out condition (near-term and long-term development), the fire protection system meets the current code requirements and has adequate firefighting capacity when the pond is full and during the operating season of the Byron-Bethany Canal. Similar to the existing conditions, the approximately one million gallons of stored water in the 96-inch diameter pipeline and the supplemental pump will continue to provide sufficient backup supply outside of the irrigation season.

It is recommended to continue to utilize the existing fire protection system with extended distribution piping and fire hydrants for the near-term and long-term development areas. The on-going O&M activities should continue in order to maximize the life of the fire pump system. An investigation of the fire pond's filtering system could reduce the amount of debris from entering the system and thereby extending the life of the fire pump.

The alternative to utilizing the on-site fire protection system is to connect to the Discovery Bay water system. Even though the Discover Bay system currently has capacity to support the Airport, there is no guarantee that a connection can be made when the Airport is developed. In addition, the Discovery Bay system is supplied by groundwater wells which could potentially be an unreliable source for future needs due to the stratigraphy in the area.

8.4 Sanitary Sewer for Future Development

The existing sanitary sewage septic system is currently functioning adequately and has limited capacity to support future development. However, due to the required size and cost of septic systems to support the future development, the use of septic systems for Airport expansion is not recommended. The size of the leach field as well as the leach field reserve area would also add constraints on Airport development.

It is recommended that the Airport explore the construction of an on-site wastewater treatment plant to handle sanitary sewer flows generated from Airport development. With this alternative, the Airport would have control of the treatment system, and could possibly use treated effluent for landscape irrigation. This alternative would require on-going O&M of the treatment plant; however, this work can be contracted to an outside service. In order to reduce construction costs, it is recommended that the package wastewater treatment plant be installed for the required full build-out capacity during the near-term development plan, unless it is expected that the long-term development would be delayed indefinitely.

A back-up alternative to an on-site wastewater treatment plant would be to connect to the Discovery Bay sanitary sewer system. While the Discovery Bay system currently has available capacity to support the Airport, there is no guarantee the system will have capacity at the time of near-term or long-term development. In addition, the fee for connecting to the Discovery Bay system is unknown, and will have to be determined at the time of application.

8.5 Domestic Water for Future Development

The development of the Airport would require a significant amount of domestic water, which would need to be potable to support the various users. Based on a review of nearby groundwater wells and conversations with Dejesus Pump, there is a low probability of locating a groundwater source in the area with the supply and water quality needed to support the future development. The existing groundwater well production has significantly decreased since it was developed. Therefore, we do not recommend the use of groundwater wells to support future site development.

It is recommended that the Airport explore construction of a package water treatment plant to treat water from BBID for potable water uses. The use of BBID water is a reliable source, and BBID has been open to discussions to supply water to the Airport. This alternative would require on-going O&M of the packaged treatment plant; however, this work can be contracted to the BBID or an outside service. A similar system is used for the nearby Mountain House community, which receives water from BBID and treats the water for potable uses at the treatment facility.

Similar to the fire protection and sanitary sewer systems, a back-up alternative would be to connect to the Discovery Bay water system. However, even though the Discover Bay system currently has capacity to support the Airport, there is no guarantee that a connection can be made when the Airport is developed. In addition, the Discovery Bay system is supplied by groundwater wells which could potentially be an unreliable source for future needs due to the stratigraphy in the area.

9. References

Advisory Circular 150/5300-13A Airport Design, U.S. Department of Transportation, Federal Aviation Administration, September 28, 2012.

Byron Airport Master Plan, Contra Costa County Public Works Department, Leigh Fisher Associates, June 2005.

Contra Costa Clean Water Program, Stormwater C.3 Guidebook, 6th Edition, February 15, 2012.

Contra Costa County Airports website, http://ca-contracostacounty.civicplus.com/static/depart/airport/

Central Contra Costa Sanitary District Collection System Master Plan Update, RMC Water and Environment, May 2010.

Engineer's Design Report, Airport Improvements, East Contra Costa County – Byron Airport, AIP No. 3-06-008-05, -06, & -07, Hodges & Shutt, February 1993.

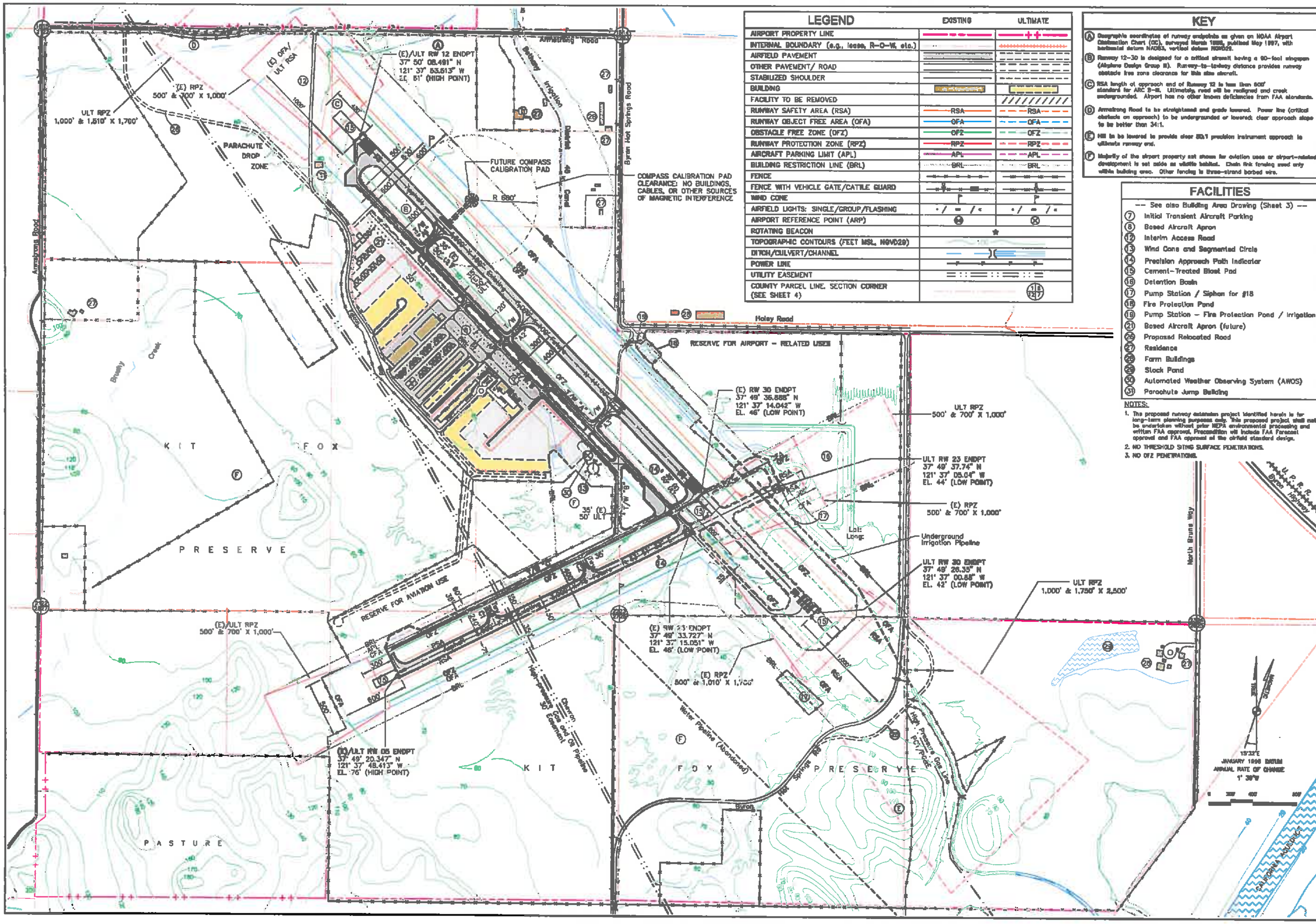
Federal Aviation Regulation Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace.

Health Officer Regulations Chapter 420-6, Subdivisions & Individual Systems, Contra Costa Health Services, October 17, 2000.

TriLink project website, http://trilink239.org/

Appendices

Appendix A Airport Layout Plan



Prepared By

LEIGH FISHER ASSOCIATES
A Division of Jacobs Consultancy Inc.

TY-LIN INTERNATIONAL | CCS

Prepared For

CONTRA COSTA COUNTY AIRPORTS

CONTRA COSTA COUNTY

Airport Layout Plan Set

BYRON AIRPORT
500 EAGLE COURT
BYRON, CALIFORNIA

Issue Log

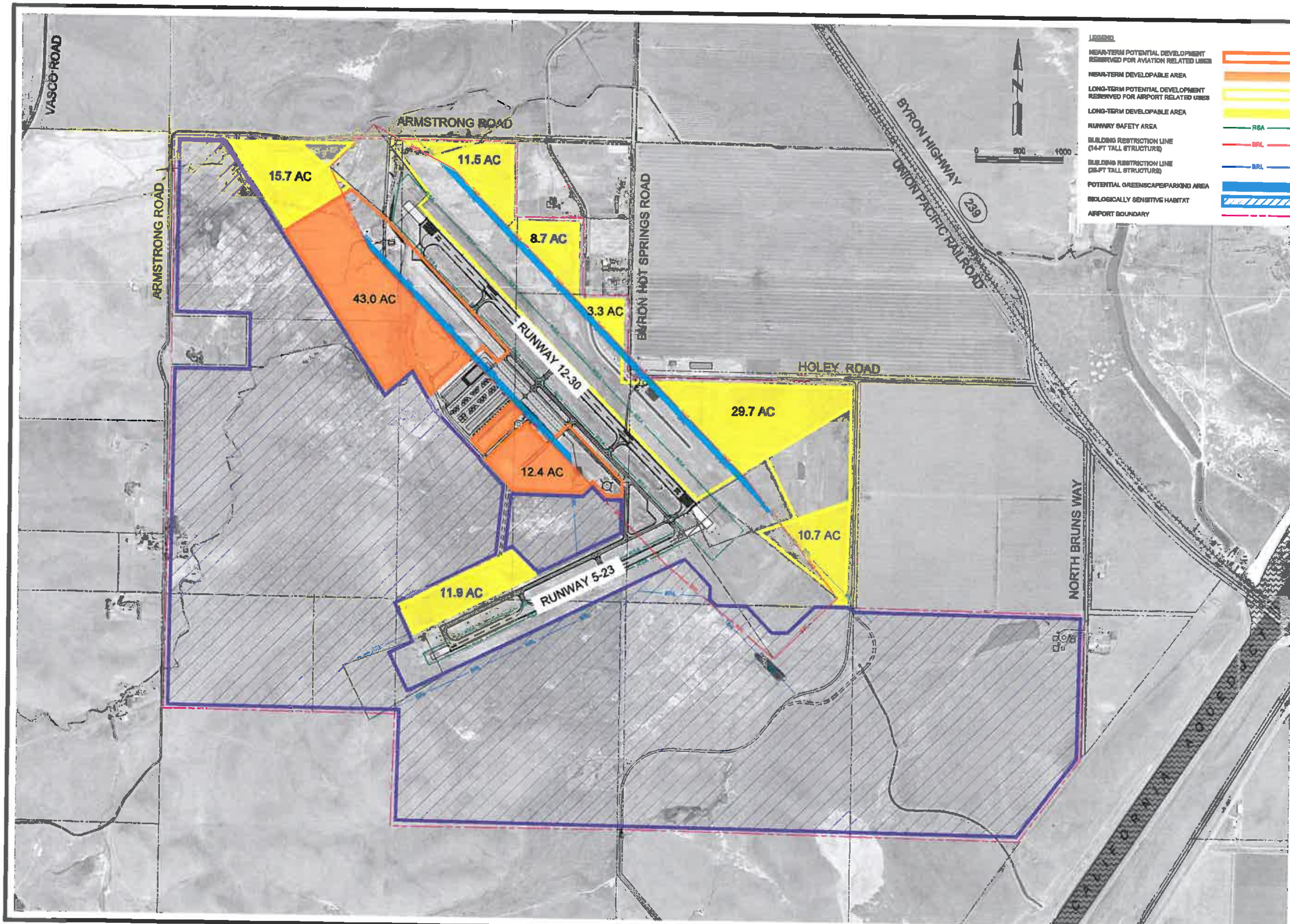
DATE	REVISION DESCRIPTION
03/18/2004	FAA REVIEW
03/18/2005	FAA APPROVAL

Drawing Title

AIRPORT LAYOUT DRAWING

SHEET 2 OF 11

Appendix B Potential Development Areas Map



Mead & Hunt

Mead & Hunt, Inc.
180 Promenade Circle, Suite 240
Sacramento, CA 95834
phone: 916-971-3661
meadhunt.com

CONTRA COSTA COUNTY
BYRON AIRPORT
Infrastructure and Utility Analysis

500 EAGLE COURT
BYRON, CA 94514

NOT FOR CONSTRUCTION

4186500-121867.00
AUG. 2013
JHK
RSS
JHK

POTENTIAL DEVELOPMENT AREAS MAP

APPX-B

Appendix C WaterCAD Model Files

Byron Airport Existing Fire Protection System

Title	Byron Airport - Fire Protection System - Existing
Engineer	
Company	Mead & Hunt, Inc.
Date	1/18/2013
Notes	Byron Airport existing fire protection system based on the as-built plans from Hodges & Schutt dated 2/1994

Scenario Summary

ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

Network Inventory

Pipes	36	-Constant Speed - No Pump Curve	0
Junctions	33	-Constant Speed - Pump Curve	1
Hydrants	0	-Shut Down After Time Delay	0
Tanks	0	-Variable Speed/Torque	0

Byron Airport Existing Fire Protection System

Network Inventory			
-Circular	0	-Pump Start - Variable Speed/Torque	0
-Non-Circular	0	Variable Speed Pump Batteries	0
-Variable Area	0	Pump Stations	0
Reservoirs	1	PRV's	0
Pumps	1	PSV's	0
-Constant Power	0	PBV's	0
-Design Point (1 Point)	0	FCV's	0
-Standard (3 Point)	1	TCV's	0
-Standard Extended	0	GPV's	0
-Custom Extended	0	Isolation Valves	0
-Multiple Point	0	Spot Elevations	0

Transient Network Inventory			
Air Valves	0	Rupture Disks	0
-Double Acting	0	Surge Valves	0
-Slow Closing	0	Surge Tanks	0
-Triple Acting	0	-Simple	0
-Vacuum Breaker	0	-Differential	0
Discharges to Atmosphere	0	-Variable Area	0
Orifice	0	Turbines	0
Rating Curve	0	Valves With Linear Area Change	0
Valve	0	Periodic Head-Flows	0
Check Valves	0	-Sinusoidal (Head)	0
-Towards Wye	0	-Not Sinusoidal (Head)	0
-Away from Wye	0	-Sinusoidal (Flow)	0
Hydropneumatic Tanks	0	-Not Sinusoidal (Flow)	0
Orifices Between Pipes	0		

Pressure Pipes Inventory			
6.0 (in)	348 ft	14.0 (in)	1,231 ft
12.0 (in)	4,957 ft	All Diameters	6,535 ft

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
31	J-1	55.00	<None>	<Collection: 0 items>	0	121.10	28.6
33	J-2	56.80	<None>	<Collection: 0 items>	0	112.10	23.9
35	J-3	57.00	<None>	<Collection: 0 items>	0	110.83	23.3
37	J-4	57.30	<None>	<Collection: 0 items>	0	110.10	22.8
39	J-5	58.00	<None>	<Collection: 0 items>	0	108.35	21.8
41	J-6	59.00	<None>	<Collection: 1 items>	1,000	105.13	20.0
43	J-7	63.00	<None>	<Collection: 0 items>	0	105.41	18.3
45	J-8	66.40	<None>	<Collection: 0 items>	0	105.68	17.0
47	J-9	66.60	<None>	<Collection: 0 items>	0	105.70	16.9
49	J-10	67.00	<None>	<Collection: 0 items>	0	105.72	16.8
51	J-11	66.90	<None>	<Collection: 0 items>	0	105.80	16.8
53	J-12	66.80	<None>	<Collection: 0 items>	0	105.95	16.9
55	J-13	66.60	<None>	<Collection: 0 items>	0	106.18	17.1
57	J-14	66.40	<None>	<Collection: 0 items>	0	106.50	17.3
59	J-15	65.90	<None>	<Collection: 0 items>	0	107.11	17.8
61	J-16	65.60	<None>	<Collection: 0 items>	0	107.53	18.1
63	J-17	65.00	<None>	<Collection: 0 items>	0	108.23	18.7

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
65	J-18	64.00	<None>	<Collection: 0 items>	0	108.63	19.3
67	J-19	61.00	<None>	<Collection: 0 items>	0	109.63	21.0
69	J-20	59.00	<None>	<Collection: 0 items>	0	110.19	22.1
71	J-21	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
74	J-22	60.00	<None>	<Collection: 1 items>	1,000	104.29	19.2
76	J-23	68.00	<None>	<Collection: 1 items>	0	105.38	16.2
78	J-24	67.30	<None>	<Collection: 0 items>	0	105.62	16.6
81	J-25	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
83	J-26	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
85	J-27	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
87	J-28	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
89	J-29	58.00	<None>	<Collection: 0 items>	0	110.41	22.7
91	J-0	43.00	<None>	<Collection: 0 items>	0	129.71	37.5
95	J-32	62.51	<None>	<Collection: 0 items>	0	104.93	18.4
98	J-30	59.43	<None>	<Collection: 1 items>	1,000	104.65	19.6
101	J-31	61.20	<None>	<Collection: 0 items>	0	104.78	18.9

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
34	P-3	464	J-1	J-2	12.0	Ductile Iron	130.0	False
36	P-4	66	J-2	J-3	12.0	Ductile Iron	130.0	False
38	P-5	92	J-3	J-4	12.0	Ductile Iron	130.0	False
40	P-6	224	J-4	J-5	12.0	Ductile Iron	130.0	False
42	P-7	410	J-5	J-6	12.0	Ductile Iron	130.0	False
44	P-8	338	J-6	J-7	12.0	Ductile Iron	130.0	False
46	P-9	336	J-7	J-8	12.0	Ductile Iron	130.0	False
48	P-10	23	J-8	J-9	12.0	Ductile Iron	130.0	False
50	P-11	35	J-9	J-10	12.0	Ductile Iron	130.0	False
52	P-12	23	J-10	J-11	12.0	Ductile Iron	130.0	False
54	P-13	45	J-11	J-12	12.0	Ductile Iron	130.0	False
56	P-14	69	J-12	J-13	12.0	Ductile Iron	130.0	False
58	P-15	94	J-13	J-14	12.0	Ductile Iron	130.0	False
60	P-16	182	J-14	J-15	12.0	Ductile Iron	130.0	False
62	P-17	127	J-15	J-16	12.0	Ductile Iron	130.0	False
64	P-18	210	J-16	J-17	12.0	Ductile Iron	130.0	False
66	P-19	118	J-17	J-18	12.0	Ductile Iron	130.0	False
68	P-20	300	J-18	J-19	12.0	Ductile Iron	130.0	False
70	P-21	168	J-19	J-20	12.0	Ductile Iron	130.0	False
72	P-22	66	J-20	J-21	12.0	Ductile Iron	130.0	False
73	P-23	126	J-21	J-3	12.0	Ductile Iron	130.0	False
79	P-26	233	J-23	J-24	12.0	Ductile Iron	130.0	False
80	P-27	100	J-24	J-10	12.0	Ductile Iron	130.0	False
82	P-28	51	J-21	J-25	6.0	Ductile Iron	130.0	False
84	P-29	182	J-25	J-26	6.0	Ductile Iron	130.0	False
86	P-30	3	J-26	J-27	6.0	Ductile Iron	130.0	False
88	P-31	111	J-27	J-28	6.0	Ductile Iron	130.0	False
90	P-32	6	J-28	J-29	12.0	Ductile Iron	130.0	False
92	P-1	240	PMP-1	J-0	14.0	Ductile Iron	130.0	False
93	P-2	942	J-0	J-1	14.0	Ductile Iron	130.0	False
94	P-0	50	R-1	PMP-1	14.0	Ductile Iron	130.0	False
97	P-25	425	J-32	J-23	12.0	Ductile Iron	130.0	False

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
99	P-33	138	J-6	J-30	12.0	PVC	150.0	False
100	P-24	182	J-30	J-22	12.0	PVC	150.0	False
102	P-35	193	J-32	J-31	12.0	PVC	150.0	False
103	P-34	164	J-31	J-30	12.0	PVC	150.0	False

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	3,000	8.51	0.019	False	0
0.000	3,000	8.51	0.019	False	0
0.000	1,839	5.22	0.008	False	0
0.000	1,839	5.22	0.008	False	0
0.000	1,839	5.22	0.008	False	0
0.000	-540	1.53	0.001	False	0
0.000	-540	1.53	0.001	False	0
0.000	-540	1.53	0.001	False	0
0.000	-540	1.53	0.001	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-1,161	3.29	0.003	False	0
0.000	-620	1.76	0.001	False	0
0.000	-620	1.76	0.001	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	3,000	6.25	0.009	False	0
0.000	3,000	6.25	0.009	False	0
0.000	3,000	6.25	0.009	False	0
0.000	-620	1.76	0.001	False	0
0.000	1,380	3.91	0.004	False	0
0.000	1,000	2.84	0.002	False	0
0.000	620	1.76	0.001	False	0
0.000	620	1.76	0.001	False	0

Byron Airport Existing Fire Protection System

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)
29	PMP-1	0.00	Fire Pump	On	35.05

Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
131.90	3,000	96.86

Byron Airport Existing Fire Protection System

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	41	Notes	
Label	J-6	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	25,664.98 ft	Y	17,139.70 ft

Byron Airport Existing Fire Protection System

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Fire Flow			
Specify Local Fire Flow Constraints?	False		

Physical			
Elevation	59.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand			
Use Local Pressure Dependent Demand Data?	False		

Transient (Initial)			
Vapor Volume (Initial)	0.0 gal		

Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Byron Airport Existing Fire Protection System

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	105.13 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	20.0 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	85.0 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)

Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi

Byron Airport Existing Fire Protection System

Results (Transient)			
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	105.13 ft	Pressure Head	46.13 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	20.0 psi	Has Calculation Messages Now?	False

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	85.0	0
1.000	255.50	85.0	0
2.000	255.50	85.0	0
3.000	255.50	85.0	0
4.000	255.50	85.0	0
5.000	255.50	85.0	0
6.000	255.50	85.0	0
7.000	255.50	85.0	0
8.000	255.50	85.0	0
9.000	255.50	85.0	0
10.000	255.50	85.0	0
11.000	255.50	85.0	0
12.000	255.50	85.0	0
13.000	255.50	85.0	0
14.000	255.50	85.0	0
15.000	255.50	85.0	0

Byron Airport Existing Fire Protection System

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
16.000	255.50	85.0	0
17.000	255.50	85.0	0
18.000	105.13	20.0	1,000
19.000	105.13	20.0	1,000
20.000	105.13	20.0	1,000
21.000	255.50	85.0	0
22.000	255.50	85.0	0
23.000	255.50	85.0	0
24.000	255.50	85.0	0

Byron Airport Existing Fire Protection System

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	74	Notes	
Label	J-22	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	25,442.71 ft	Y	17,369.58 ft

Byron Airport Existing Fire Protection System

Active Topology

Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Fire Flow

Specify Local Fire Flow Constraints?	False

Physical

Elevation	60.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand

Use Local Pressure Dependent Demand Data?	False

Transient (Initial)

Vapor Volume (Initial)	0.0 gal

Water Quality

Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Byron Airport Existing Fire Protection System

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	104.29 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	19.2 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	84.6 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)

Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi

Results (Transient)			
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	104.29 ft	Pressure Head	44.29 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	19.2 psi	Has Calculation Messages Now?	False

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	84.6	0
1.000	255.50	84.6	0
2.000	255.50	84.6	0
3.000	255.50	84.6	0
4.000	255.50	84.6	0
5.000	255.50	84.6	0
6.000	255.50	84.6	0
7.000	255.50	84.6	0
8.000	255.50	84.6	0
9.000	255.50	84.6	0
10.000	255.50	84.6	0
11.000	255.50	84.6	0
12.000	255.50	84.6	0
13.000	255.50	84.6	0
14.000	255.50	84.6	0
15.000	255.50	84.6	0

Byron Airport Existing Fire Protection System

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
16.000	255.50	84.6	0
17.000	255.50	84.6	0
18.000	104.29	19.2	1,000
19.000	104.29	19.2	1,000
20.000	104.29	19.2	1,000
21.000	255.50	84.6	0
22.000	255.50	84.6	0
23.000	255.50	84.6	0
24.000	255.50	84.6	0

Byron Airport Existing Fire Protection System

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	98	Notes	
Label	J-30	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	25,569.45 ft	Y	17,238.67 ft

Byron Airport Existing Fire Protection System

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Fire Flow			
Specify Local Fire Flow Constraints?	False		

Physical			
Elevation	59.43 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand	
Use Local Pressure Dependent Demand Data?	False

Transient (Initial)	
Vapor Volume (Initial)	0.0 gal

Water Quality			
Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Byron Airport Existing Fire Protection System

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	104.65 ft	Trace (Maximum)	(N/A) %
Pressure (Minimum)	19.6 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	84.8 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)

Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi

Byron Airport Existing Fire Protection System

Results (Transient)			
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	104.65 ft	Pressure Head	45.22 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	19.6 psi	Has Calculation Messages Now?	False

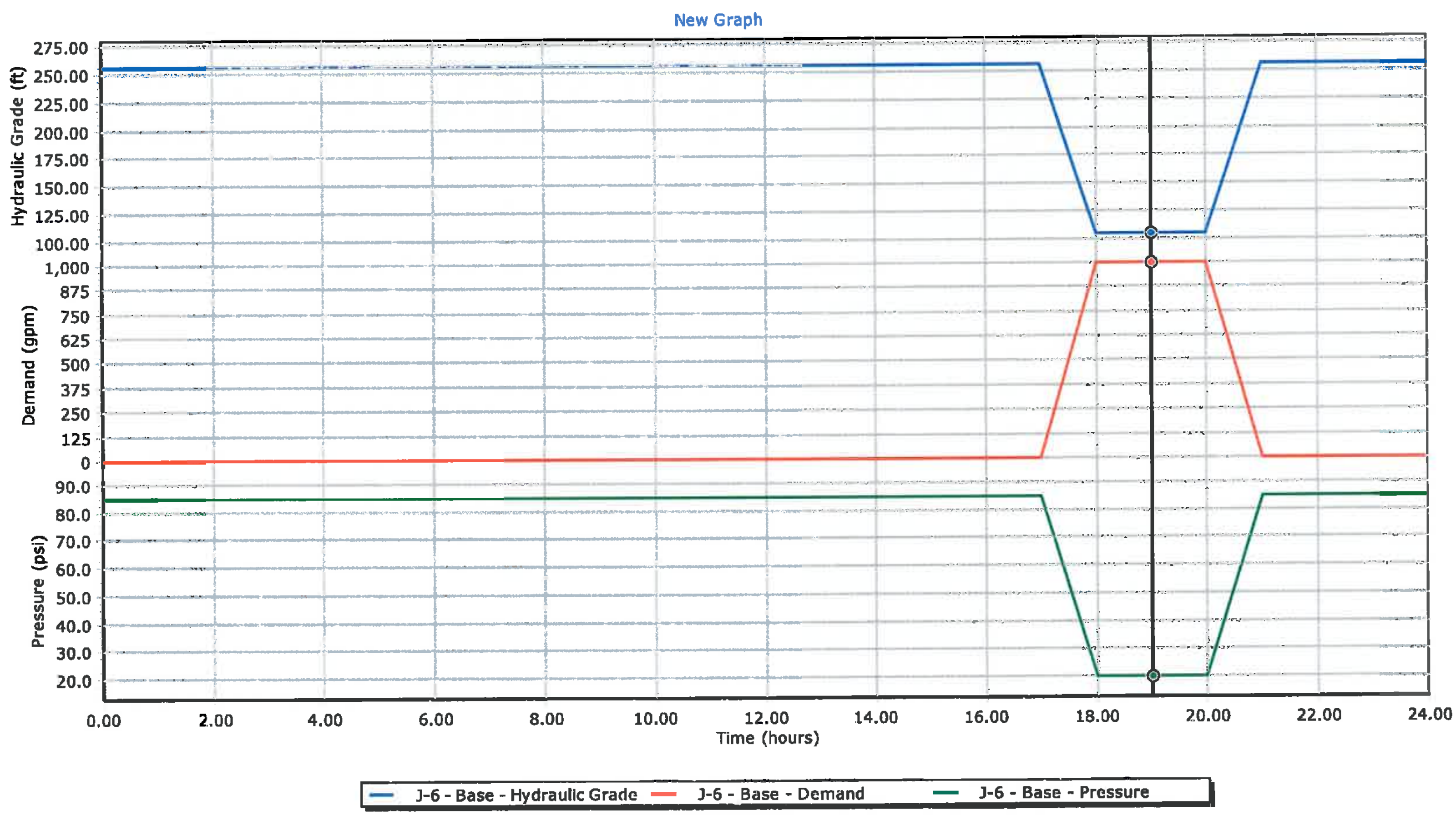
Calculated Results Summary

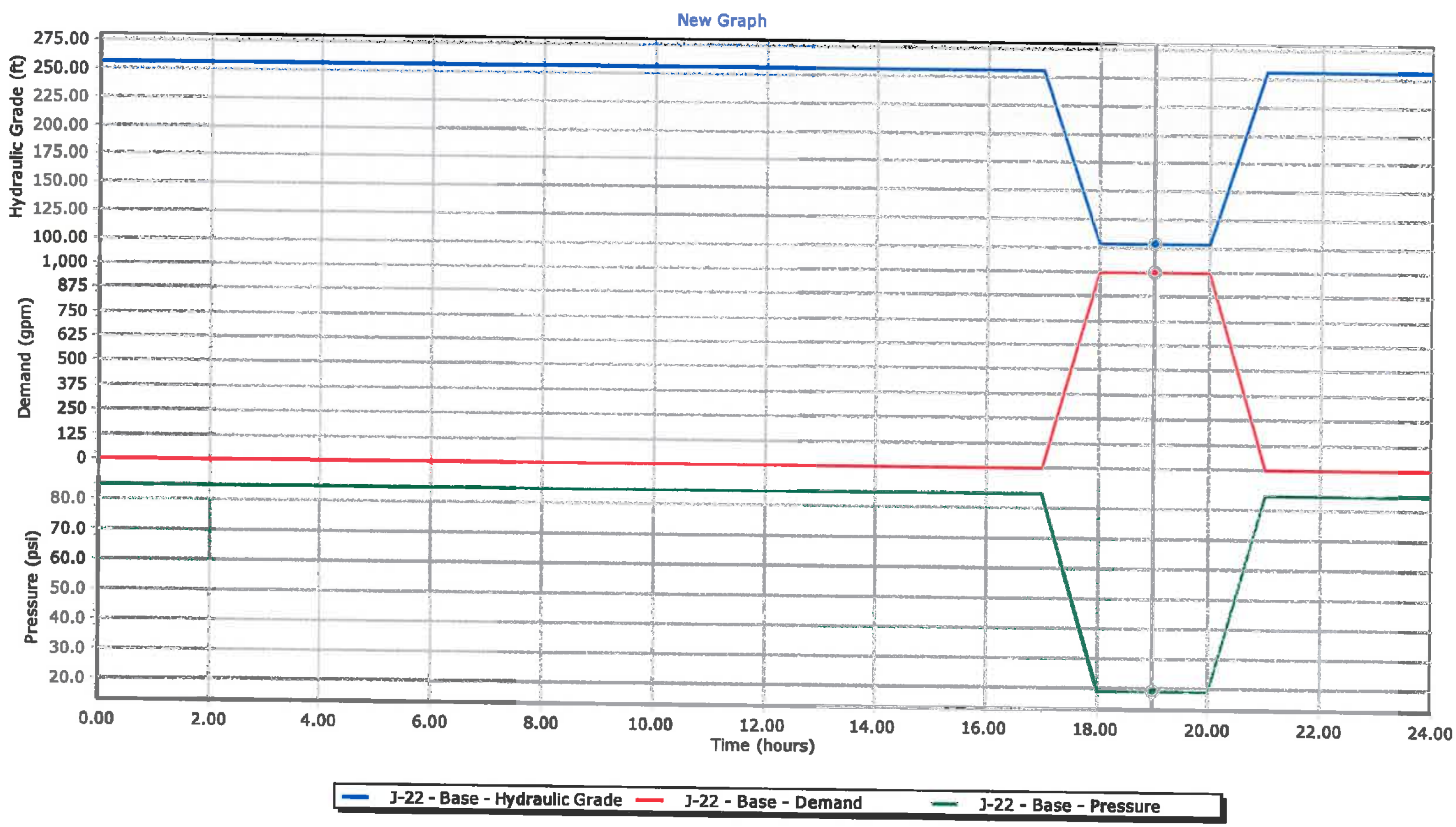
Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	84.8	0
1.000	255.50	84.8	0
2.000	255.50	84.8	0
3.000	255.50	84.8	0
4.000	255.50	84.8	0
5.000	255.50	84.8	0
6.000	255.50	84.8	0
7.000	255.50	84.8	0
8.000	255.50	84.8	0
9.000	255.50	84.8	0
10.000	255.50	84.8	0
11.000	255.50	84.8	0
12.000	255.50	84.8	0
13.000	255.50	84.8	0
14.000	255.50	84.8	0
15.000	255.50	84.8	0

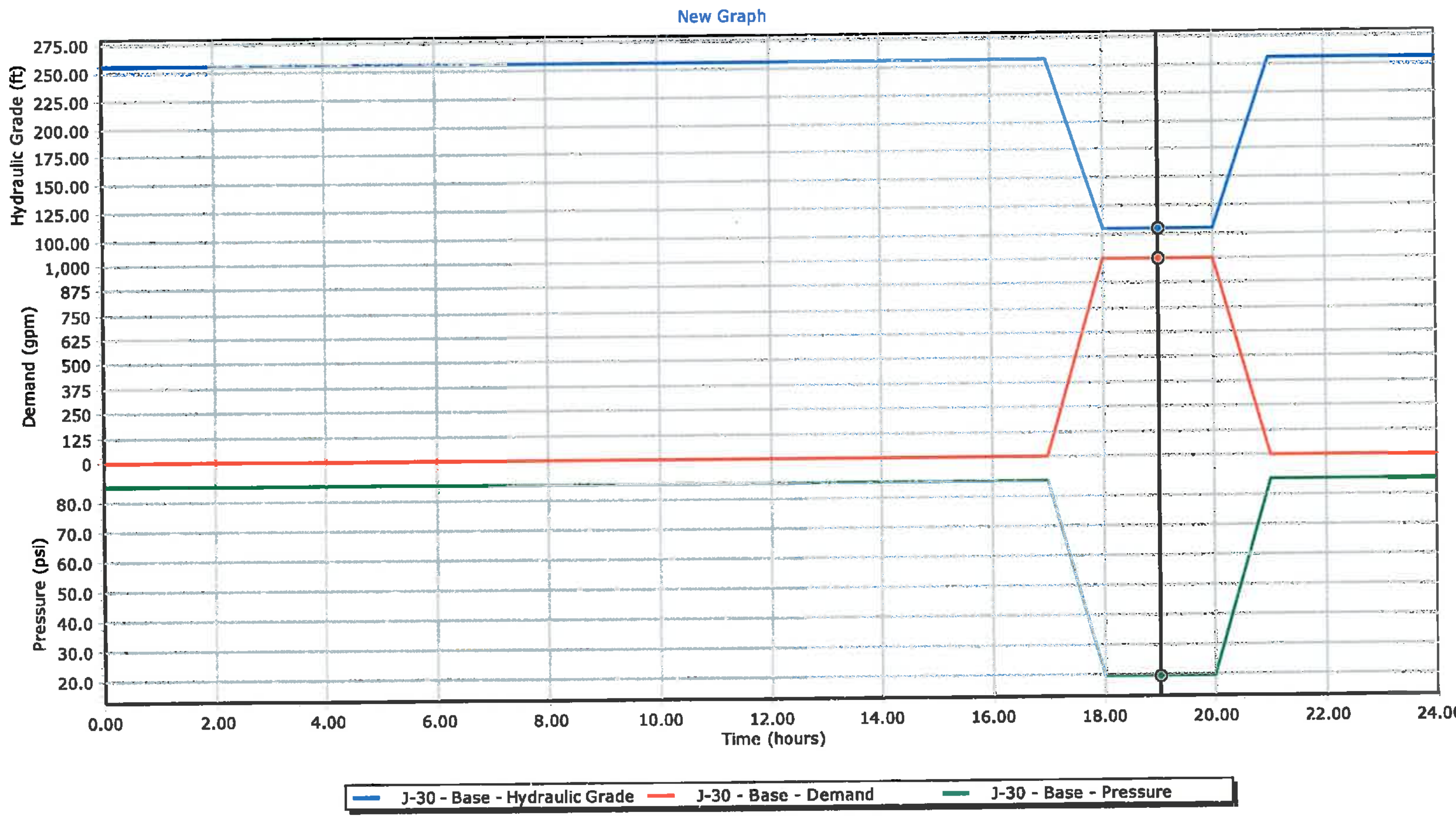
Byron Airport Existing Fire Protection System

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
16.000	255.50	84.8	0
17.000	255.50	84.8	0
18.000	104.65	19.6	1,000
19.000	104.65	19.6	1,000
20.000	104.65	19.6	1,000
21.000	255.50	84.8	0
22.000	255.50	84.8	0
23.000	255.50	84.8	0
24.000	255.50	84.8	0


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-6 - Base - Hydraulic Grade
J-6 - Base - Demand
J-6 - Base - Pressure


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-22 - Base - Hydraulic Grade
J-22 - Base - Demand
J-22 - Base - Pressure


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-30 - Base - Hydraulic Grade
J-30 - Base - Demand
J-30 - Base - Pressure

Project Inventory: Bryon Airport proposed fire protection.wtg

Title	Byron Airport - Fire Protection System - Existing
Engineer	
Company	Mead & Hunt, Inc.
Date	1/18/2013
Notes	Byron Airport existing fire protection system based on the as-built plans from Hodges & Schutt dated 2/1994

Scenario Summary

ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

Network Inventory

Pipes	89	-Constant Speed - No Pump Curve	0
Junctions	82	-Constant Speed - Pump Curve	1

Project Inventory: Bryon Airport proposed fire protection.wtg

Network Inventory

Hydrants	0	-Shut Down After Time Delay	0
Tanks	0	-Variable Speed/Torque	0
-Circular	0	-Pump Start - Variable Speed/Torque	0
-Non-Circular	0	Variable Speed Pump Batteries	0
-Variable Area	0	Pump Stations	0
Reservoirs	1	PRV's	0
Pumps	1	PSV's	0
-Constant Power	0	PBV's	0
-Design Point (1 Point)	0	FCV's	0
-Standard (3 Point)	1	TCV's	0
-Standard Extended	0	GPV's	0
-Custom Extended	0	Isolation Valves	0
-Multiple Point	0	Spot Elevations	0

Transient Network Inventory

Air Valves	0	Rupture Disks	0
-Double Acting	0	Surge Valves	0
-Slow Closing	0	Surge Tanks	0
-Triple Acting	0	-Simple	0
-Vacuum Breaker	0	-Differential	0
Discharges to Atmosphere	0	-Variable Area	0
Orifice	0	Turbines	0
Rating Curve	0	Valves With Linear Area Change	0
Valve	0	Periodic Head-Flows	0
Check Valves	0	-Sinusoidal (Head)	0
-Towards Wye	0	-Not Sinusoidal (Head)	0
-Away from Wye	0	-Sinusoidal (Flow)	0
Hydropneumatic Tanks	0	-Not Sinusoidal (Flow)	0
Orifices Between Pipes	0		

Project Inventory: Bryon Airport proposed fire protection.wtg

Pressure Pipes Inventory			
6.0 (in)	354 ft	14.0 (in)	1,231 ft
12.0 (in)	26,723 ft	All Diameters	28,307 ft

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
31	J-1	55.00	<None>	<Collection: 0 items>	0	128.41	31.8
33	J-2	56.80	<None>	<Collection: 0 items>	0	128.78	31.1
35	J-3	57.00	<None>	<Collection: 0 items>	0	128.83	31.1
37	J-4	57.30	<None>	<Collection: 0 items>	0	128.86	31.0
39	J-5	58.00	<None>	<Collection: 0 items>	0	128.93	30.7
41	J-6	59.00	<None>	<Collection: 0 items>	0	129.05	30.3
43	J-7	63.00	<None>	<Collection: 0 items>	0	129.05	28.6
45	J-8	66.40	<None>	<Collection: 0 items>	0	129.05	27.1
47	J-9	66.60	<None>	<Collection: 0 items>	0	129.05	27.0
49	J-10	67.00	<None>	<Collection: 0 items>	0	129.05	26.8
51	J-11	66.90	<None>	<Collection: 0 items>	0	129.05	26.9
53	J-12	66.80	<None>	<Collection: 0 items>	0	129.04	26.9
55	J-13	66.60	<None>	<Collection: 0 items>	0	129.03	27.0
57	J-14	66.40	<None>	<Collection: 0 items>	0	129.02	27.1
59	J-15	65.90	<None>	<Collection: 0 items>	0	128.99	27.3
61	J-16	65.60	<None>	<Collection: 0 items>	0	128.98	27.4

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
63	J-17	65.00	<None>	<Collection: 0 items>	0	128.95	27.7
65	J-18	64.00	<None>	<Collection: 0 items>	0	128.93	28.1
67	J-19	61.00	<None>	<Collection: 0 items>	0	128.88	29.4
69	J-20	59.00	<None>	<Collection: 0 items>	0	128.86	30.2
71	J-21	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
74	J-22	60.00	<None>	<Collection: 0 items>	0	129.12	29.9
76	J-23	68.00	<None>	<Collection: 1 items>	0	129.10	26.4
78	J-24	67.30	<None>	<Collection: 0 items>	0	129.07	26.7
81	J-25	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
83	J-26	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
85	J-27	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
87	J-28	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
89	J-29	58.00	<None>	<Collection: 0 items>	0	128.85	30.7
91	J-0	43.00	<None>	<Collection: 0 items>	0	133.06	39.0
95	J-32	62.51	<None>	<Collection: 0 items>	0	129.09	28.8
98	J-30	59.43	<None>	<Collection: 0 items>	0	129.09	30.1

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
101	J-31	61.20	<None>	<Collection: 0 items>	0	129.09	29.4
107	J-34	60.00	<None>	<Collection: 0 items>	0	129.22	29.9
109	J-35	60.00	<None>	<Collection: 0 items>	0	129.31	30.0
111	J-36	60.00	<None>	<Collection: 0 items>	0	129.36	30.0
113	J-37	60.00	<None>	<Collection: 0 items>	0	129.36	30.0
115	J-38	60.00	<None>	<Collection: 0 items>	0	129.36	30.0
117	J-39	60.00	<None>	<Collection: 0 items>	0	129.29	30.0
119	J-40	60.00	<None>	<Collection: 0 items>	0	129.21	29.9
121	J-41	60.00	<None>	<Collection: 0 items>	0	129.15	29.9
124	J-42	60.00	<None>	<Collection: 0 items>	0	129.40	30.0
126	J-43	60.00	<None>	<Collection: 0 items>	0	129.49	30.1
128	J-44	60.00	<None>	<Collection: 0 items>	0	129.52	30.1
130	J-45	60.00	<None>	<Collection: 0 items>	0	129.52	30.1
132	J-46	60.00	<None>	<Collection: 0 items>	0	129.52	30.1
134	J-47	60.00	<None>	<Collection: 0 items>	0	129.44	30.0
137	J-48	60.00	<None>	<Collection: 0 items>	0	129.59	30.1

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
139	J-49	60.00	<None>	<Collection: 0 items>	0	129.70	30.2
141	J-50	60.00	<None>	<Collection: 0 items>	0	129.71	30.2
143	J-51	60.00	<None>	<Collection: 0 items>	0	129.68	30.1
145	J-52	60.00	<None>	<Collection: 0 items>	0	129.65	30.1
147	J-53	60.00	<None>	<Collection: 0 items>	0	129.64	30.1
149	J-54	60.00	<None>	<Collection: 0 items>	0	129.58	30.1
152	J-55	60.00	<None>	<Collection: 0 items>	0	121.00	26.4
154	J-56	60.00	<None>	<Collection: 0 items>	0	115.67	24.1
156	J-57	60.00	<None>	<Collection: 0 items>	0	108.23	20.9
158	J-58	60.00	<None>	<Collection: 0 items>	0	104.33	19.2
160	J-59	60.00	<None>	<Collection: 1 items>	1,000	101.38	17.9
162	J-60	60.00	<None>	<Collection: 1 items>	1,000	97.86	16.4
164	J-61	60.00	<None>	<Collection: 1 items>	1,000	96.89	16.0
166	J-62	43.24	<None>	<Collection: 0 items>	0	132.93	38.8
169	J-63	60.00	<None>	<Collection: 0 items>	0	132.89	31.5
171	J-64	60.00	<None>	<Collection: 0 items>	0	132.60	31.4

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
173	J-65	60.00	<None>	<Collection: 0 items>	0	132.30	31.3
175	J-66	60.00	<None>	<Collection: 0 items>	0	132.00	31.2
177	J-67	60.00	<None>	<Collection: 0 items>	0	131.70	31.0
179	J-68	60.00	<None>	<Collection: 0 items>	0	131.39	30.9
181	J-69	60.00	<None>	<Collection: 0 items>	0	131.09	30.8
183	J-70	60.00	<None>	<Collection: 0 items>	0	130.77	30.6
185	J-71	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
187	J-72	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
189	J-73	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
191	J-74	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
193	J-75	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
195	J-76	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
197	J-77	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
199	J-78	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
201	J-79	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
203	J-80	60.00	<None>	<Collection: 0 items>	0	132.93	31.6

FlexTable: Junction Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
205	J-81	60.00	<None>	<Collection: 0 items>	0	132.93	31.6
207	J-82	60.00	<None>	<Collection: 0 items>	0	132.93	31.6

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
34	P-3	464	J-1	J-2	12.0	Ductile Iron	130.0	False
36	P-4	66	J-2	J-3	12.0	Ductile Iron	130.0	False
38	P-5	92	J-3	J-4	12.0	Ductile Iron	130.0	False
40	P-6	224	J-4	J-5	12.0	Ductile Iron	130.0	False
42	P-7	410	J-5	J-6	12.0	Ductile Iron	130.0	False
44	P-8	338	J-6	J-7	12.0	Ductile Iron	130.0	False
46	P-9	336	J-7	J-8	12.0	Ductile Iron	130.0	False
48	P-10	23	J-8	J-9	12.0	Ductile Iron	130.0	False
50	P-11	35	J-9	J-10	12.0	Ductile Iron	130.0	False
52	P-12	23	J-10	J-11	12.0	Ductile Iron	130.0	False
54	P-13	45	J-11	J-12	12.0	Ductile Iron	130.0	False
56	P-14	69	J-12	J-13	12.0	Ductile Iron	130.0	False
58	P-15	94	J-13	J-14	12.0	Ductile Iron	130.0	False
60	P-16	182	J-14	J-15	12.0	Ductile Iron	130.0	False
62	P-17	127	J-15	J-16	12.0	Ductile Iron	130.0	False
64	P-18	210	J-16	J-17	12.0	Ductile Iron	130.0	False
66	P-19	118	J-17	J-18	12.0	Ductile Iron	130.0	False
68	P-20	300	J-18	J-19	12.0	Ductile Iron	130.0	False
70	P-21	168	J-19	J-20	12.0	Ductile Iron	130.0	False
72	P-22	66	J-20	J-21	12.0	Ductile Iron	130.0	False
73	P-23	126	J-21	J-3	12.0	Ductile Iron	130.0	False
79	P-26	233	J-23	J-24	12.0	Ductile Iron	130.0	False
80	P-27	100	J-24	J-10	12.0	Ductile Iron	130.0	False
82	P-28	51	J-21	J-25	6.0	Ductile Iron	130.0	False
84	P-29	182	J-25	J-26	6.0	Ductile Iron	130.0	False
86	P-30	3	J-26	J-27	6.0	Ductile Iron	130.0	False
88	P-31	111	J-27	J-28	6.0	Ductile Iron	130.0	False
90	P-32	6	J-28	J-29	6.0	Ductile Iron	130.0	False
92	P-1	240	PMP-1	J-0	14.0	Ductile Iron	130.0	False
94	P-0	50	R-1	PMP-1	14.0	Ductile Iron	130.0	False
97	P-25	425	J-32	J-23	12.0	Ductile Iron	130.0	False

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
99	P-33	138	J-6	J-30	12.0	PVC	150.0	False
100	P-24	182	J-30	J-22	12.0	PVC	150.0	False
102	P-35	193	J-32	J-31	12.0	PVC	150.0	False
103	P-34	164	J-31	J-30	12.0	PVC	150.0	False
108	P-42	510	J-22	J-34	12.0	PVC	150.0	False
110	P-43	500	J-34	J-35	12.0	PVC	150.0	False
112	P-44	285	J-35	J-36	12.0	PVC	150.0	False
114	P-45	380	J-36	J-37	12.0	PVC	150.0	False
116	P-46	381	J-37	J-38	12.0	PVC	150.0	False
118	P-47	510	J-38	J-39	12.0	PVC	150.0	False
120	P-48	509	J-39	J-40	12.0	PVC	150.0	False
122	P-49	412	J-40	J-41	12.0	PVC	150.0	False
123	P-50	338	J-41	J-23	12.0	PVC	150.0	False
125	P-51	214	J-36	J-42	12.0	PVC	150.0	False
127	P-52	499	J-42	J-43	12.0	PVC	150.0	False
129	P-53	176	J-43	J-44	12.0	PVC	150.0	False
131	P-54	297	J-44	J-45	12.0	PVC	150.0	False
133	P-55	293	J-45	J-46	12.0	PVC	150.0	False
135	P-56	469	J-46	J-47	12.0	PVC	150.0	False
136	P-57	499	J-47	J-38	12.0	PVC	150.0	False
138	P-58	324	J-44	J-48	12.0	PVC	150.0	False
140	P-59	501	J-48	J-49	12.0	PVC	150.0	False
142	P-60	61	J-49	J-50	12.0	PVC	150.0	False
144	P-61	245	J-50	J-51	12.0	PVC	150.0	False
146	P-62	244	J-51	J-52	12.0	PVC	150.0	False
148	P-63	122	J-52	J-53	12.0	PVC	150.0	False
150	P-64	500	J-53	J-54	12.0	PVC	150.0	False
151	P-65	500	J-54	J-46	12.0	PVC	150.0	False
153	P-66	498	J-1	J-55	12.0	PVC	150.0	False
155	P-67	359	J-55	J-56	12.0	PVC	150.0	False
157	P-68	500	J-56	J-57	12.0	PVC	150.0	False

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?
159	P-69	262	J-57	J-58	12.0	PVC	150.0	False
161	P-70	199	J-58	J-59	12.0	PVC	150.0	False
163	P-71	501	J-59	J-60	12.0	PVC	150.0	False
165	P-72	500	J-60	J-61	12.0	PVC	150.0	False
167	P-73	19	J-0	J-62	14.0	PVC	150.0	False
168	P-74	923	J-62	J-1	14.0	PVC	150.0	False
170	P-75	56	J-62	J-63	12.0	PVC	150.0	False
172	P-76	475	J-63	J-64	12.0	PVC	150.0	False
174	P-77	501	J-64	J-65	12.0	PVC	150.0	False
176	P-78	499	J-65	J-66	12.0	PVC	150.0	False
178	P-79	501	J-66	J-67	12.0	PVC	150.0	False
180	P-80	500	J-67	J-68	12.0	PVC	150.0	False
182	P-81	499	J-68	J-69	12.0	PVC	150.0	False
184	P-82	528	J-69	J-70	12.0	PVC	150.0	False
186	P-83	16	J-62	J-71	12.0	PVC	150.0	False
188	P-84	96	J-71	J-72	12.0	PVC	150.0	False
190	P-85	500	J-72	J-73	12.0	PVC	150.0	False
192	P-86	501	J-73	J-74	12.0	PVC	150.0	False
194	P-87	498	J-74	J-75	12.0	PVC	150.0	False
196	P-88	501	J-75	J-76	12.0	PVC	150.0	False
198	P-89	500	J-76	J-77	12.0	PVC	150.0	False
200	P-90	501	J-77	J-78	12.0	PVC	150.0	False
202	P-91	498	J-78	J-79	12.0	PVC	150.0	False
204	P-92	501	J-79	J-80	12.0	PVC	150.0	False
206	P-93	500	J-80	J-81	12.0	PVC	150.0	False
208	P-94	264	J-81	J-82	12.0	PVC	150.0	False
209	P-95	1,746	J-70	J-50	12.0	PVC	150.0	False

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	-532	1.51	0.001	False	0

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	-532	1.51	0.001	False	0
0.000	-319	0.91	0.000	False	0
0.000	-319	0.91	0.000	False	0
0.000	-319	0.91	0.000	False	0
0.000	13	0.04	0.000	False	0
0.000	13	0.04	0.000	False	0
0.000	13	0.04	0.000	False	0
0.000	13	0.04	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	213	0.61	0.000	False	0
0.000	200	0.57	0.000	False	0
0.000	200	0.57	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	3,000	6.25	0.009	False	0
0.000	3,000	6.25	0.009	False	0
0.000	-52	0.15	0.000	False	0

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	-333	0.94	0.000	False	0
0.000	-281	0.80	0.000	False	0
0.000	52	0.15	0.000	False	0
0.000	52	0.15	0.000	False	0
0.000	-281	0.80	0.000	False	0
0.000	-281	0.80	0.000	False	0
0.000	-281	0.80	0.000	False	0
0.000	-8	0.02	0.000	False	0
0.000	-8	0.02	0.000	False	0
0.000	251	0.71	0.000	False	0
0.000	251	0.71	0.000	False	0
0.000	251	0.71	0.000	False	0
0.000	251	0.71	0.000	False	0
0.000	-273	0.78	0.000	False	0
0.000	-273	0.78	0.000	False	0
0.000	-273	0.78	0.000	False	0
0.000	35	0.10	0.000	False	0
0.000	35	0.10	0.000	False	0
0.000	259	0.73	0.000	False	0
0.000	259	0.73	0.000	False	0
0.000	-308	0.87	0.000	False	0
0.000	-308	0.87	0.000	False	0
0.000	-308	0.87	0.000	False	0
0.000	224	0.64	0.000	False	0
0.000	224	0.64	0.000	False	0
0.000	224	0.64	0.000	False	0
0.000	224	0.64	0.000	False	0
0.000	224	0.64	0.000	False	0
0.000	3,000	8.51	0.015	False	0
0.000	3,000	8.51	0.015	False	0

FlexTable: Pipe Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
0.000	3,000	8.51	0.015	False	0
0.000	3,000	8.51	0.015	False	0
0.000	3,000	8.51	0.015	False	0
0.000	2,000	5.67	0.007	False	0
0.000	1,000	2.84	0.002	False	0
0.000	3,000	6.25	0.007	False	0
0.000	2,468	5.14	0.005	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	532	1.51	0.001	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	0	0.00	0.000	False	0
0.000	532	1.51	0.001	False	0

FlexTable: Pump Table (Bryon Airport proposed fire protection.wtg)

Current Time: 19.000 hours

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
29	PMP-1	0.00	Fire Pump	On	35.05	135.25	3,000	100.20

Junction Detailed Report: J-59

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	160	Notes	
Label	J-59	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	25,666.33 ft	Y	14,794.83 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-59

Fire Flow

Specify Local Fire Flow Constraints?	False		

Physical

Elevation	60.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand

Use Local Pressure Dependent Demand Data?	False		

Transient (Initial)

Vapor Volume (Initial)	0.0 gal		

Water Quality

Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	101.38 ft	Trace (Maximum)	(N/A) %

Junction Detailed Report: J-59

Results (Statistics)			
Pressure (Minimum)	17.9 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	84.6 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	101.38 ft	Pressure Head	41.38 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	17.9 psi	Has Calculation Messages Now?	False

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	84.6	0
1.000	255.50	84.6	0
2.000	255.50	84.6	0
3.000	255.50	84.6	0
4.000	255.50	84.6	0
5.000	255.50	84.6	0
6.000	255.50	84.6	0
7.000	255.50	84.6	0
8.000	255.50	84.6	0
9.000	255.50	84.6	0
10.000	255.50	84.6	0
11.000	255.50	84.6	0
12.000	255.50	84.6	0
13.000	255.50	84.6	0
14.000	255.50	84.6	0
15.000	255.50	84.6	0
16.000	255.50	84.6	0
17.000	255.50	84.6	0
18.000	101.38	17.9	1,000
19.000	101.38	17.9	1,000
20.000	101.38	17.9	1,000
21.000	255.50	84.6	0
22.000	255.50	84.6	0
23.000	255.50	84.6	0

Junction Detailed Report: J-59

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
24.000	255.50	84.6	0

Junction Detailed Report: J-60

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	162	Notes	
Label	J-60	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	25,215.58 ft	Y	14,575.85 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-60

Fire Flow

Specify Local Fire Flow Constraints?	False

Physical

Elevation	60.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand

Use Local Pressure Dependent Demand Data?	False

Transient (Initial)

Vapor Volume (Initial)	0.0 gal

Water Quality

Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	97.86 ft	Trace (Maximum)	(N/A) %

Junction Detailed Report: J-60

Results (Statistics)			
Pressure (Minimum)	16.4 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	84.6 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	97.86 ft	Pressure Head	37.86 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	16.4 psi	Has Calculation Messages Now?	False

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	84.6	0
1.000	255.50	84.6	0
2.000	255.50	84.6	0
3.000	255.50	84.6	0
4.000	255.50	84.6	0
5.000	255.50	84.6	0
6.000	255.50	84.6	0
7.000	255.50	84.6	0
8.000	255.50	84.6	0
9.000	255.50	84.6	0
10.000	255.50	84.6	0
11.000	255.50	84.6	0
12.000	255.50	84.6	0
13.000	255.50	84.6	0
14.000	255.50	84.6	0
15.000	255.50	84.6	0
16.000	255.50	84.6	0
17.000	255.50	84.6	0
18.000	97.86	16.4	1,000
19.000	97.86	16.4	1,000
20.000	97.86	16.4	1,000
21.000	255.50	84.6	0
22.000	255.50	84.6	0
23.000	255.50	84.6	0

Junction Detailed Report: J-60

Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
24.000	255.50	84.6	0

Junction Detailed Report: J-61

Scenario Summary	
ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Flushing	Base Flushing
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

<General>			
ID	164	Notes	
Label	J-61	Hyperlinks	<Collection: 0 items>

GIS-IDs

GIS-ID

<Geometry>			
X	24,766.66 ft	Y	14,355.04 ft

Active Topology	
Is Active?	True

Demand Collection

Demand (Base) (gpm)	Pattern (Demand)
1,000.00	3 Hour Fire

Unit Demand Collection

Number of Unit Demands	Unit Demand	Unit Demand Unit	Demand (Base) (gpm)	Pattern (Demand)

Junction Detailed Report: J-61

Fire Flow

Specify Local Fire Flow Constraints?	False		

Physical

Elevation	60.00 ft	Emitter Coefficient	0.000 gpm/psi^n
Zone	<None>		

Pressure Dependent Demand

Use Local Pressure Dependent Demand Data?	False		

Transient (Initial)

Vapor Volume (Initial)	0.0 gal		

Water Quality

Age (Initial)	0.000 hours	Is Constituent Source?	False
Concentration (Initial)	0.0 mg/L	Trace (Initial)	0.0 %

Results (Fire Flow)

Satisfies Fire Flow Constraints?	(N/A)	Fire Flow (Total Upper Limit)	(N/A) gpm
Fire Flow (Available)	(N/A) gpm	Pressure (Calculated Residual @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Residual)	(N/A) psi	Pressure (Calculated Zone Lower Limit @ Total Flow Needed)	(N/A) psi
Pressure (Calculated Zone Lower Limit)	(N/A) psi	Velocity of Maximum Pipe	(N/A) ft/s
Pressure (Calculated System Lower Limit)	(N/A) psi	Junction w/ Minimum Pressure (System)	(N/A)
Is Fire Flow Run Balanced?	(N/A)	Junction w/ Minimum Pressure (Zone)	(N/A)
Fire Flow Iterations	(N/A)	Pipe w/ Maximum Velocity	(N/A)
Flow (Total Needed)	(N/A) gpm	Junction w/ Minimum Pressure (Zone @ Total Flow Needed)	(N/A)
Flow (Total Available)	(N/A) gpm		

Results (Pressure Dependent Demands)

Demand Shortage	0 gpm	Shortfall (Cumulative)	0.00 MG
Demand (Cumulative)	0.06 MG	Supply Rate (Cumulative)	100.0 %
Supply (Cumulative)	0.06 MG	Demand (Target)	1,000 gpm

Results (Statistics)

Demand (Minimum)	0 gpm	Age (Minimum)	(N/A) hours
Demand (Maximum)	1,000 gpm	Age (Maximum)	(N/A) hours
Hydraulic Grade (Maximum)	255.50 ft	Trace (Minimum)	(N/A) %
Hydraulic Grade (Minimum)	96.89 ft	Trace (Maximum)	(N/A) %

Junction Detailed Report: J-61

Results (Statistics)			
Pressure (Minimum)	16.0 psi	Concentration (Minimum)	(N/A) mg/L
Pressure (Maximum)	84.6 psi	Concentration (Maximum)	(N/A) mg/L

Results (Transient)			
Head (Maximum, Transient)	(N/A) ft	Pressure (Minimum, Transient)	(N/A) psi
Head (Minimum, Transient)	(N/A) ft	Air Volume (Maximum, Transient)	(N/A) gal
Pressure (Maximum, Transient)	(N/A) psi	Vapor Volume (Maximum, Transient)	(N/A) gal

Results (Water Quality)			
Age (Calculated)	(N/A) hours	Concentration (Calculated)	(N/A) mg/L
Trace (Calculated)	(N/A) %		

Results			
Hydraulic Grade	96.89 ft	Pressure Head	36.89 ft
Demand	1,000 gpm	Demand Adjusted Population	(N/A) Capita
Pressure	16.0 psi	Has Calculation Messages Now?	False

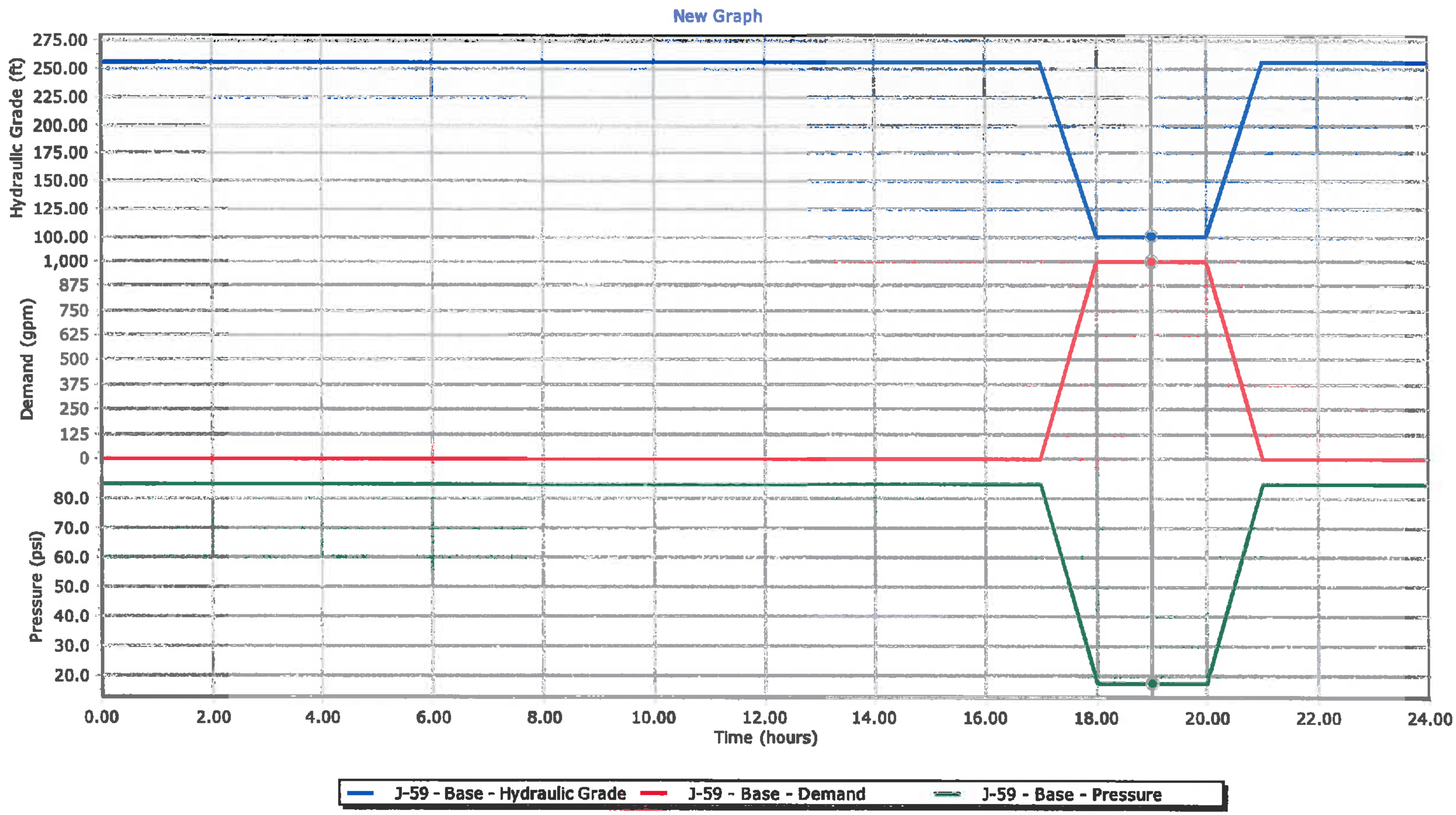
Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
0.000	255.50	84.6	0
1.000	255.50	84.6	0
2.000	255.50	84.6	0
3.000	255.50	84.6	0
4.000	255.50	84.6	0
5.000	255.50	84.6	0
6.000	255.50	84.6	0
7.000	255.50	84.6	0
8.000	255.50	84.6	0
9.000	255.50	84.6	0
10.000	255.50	84.6	0
11.000	255.50	84.6	0
12.000	255.50	84.6	0
13.000	255.50	84.6	0
14.000	255.50	84.6	0
15.000	255.50	84.6	0
16.000	255.50	84.6	0
17.000	255.50	84.6	0
18.000	96.89	16.0	1,000
19.000	96.89	16.0	1,000
20.000	96.89	16.0	1,000
21.000	255.50	84.6	0
22.000	255.50	84.6	0
23.000	255.50	84.6	0

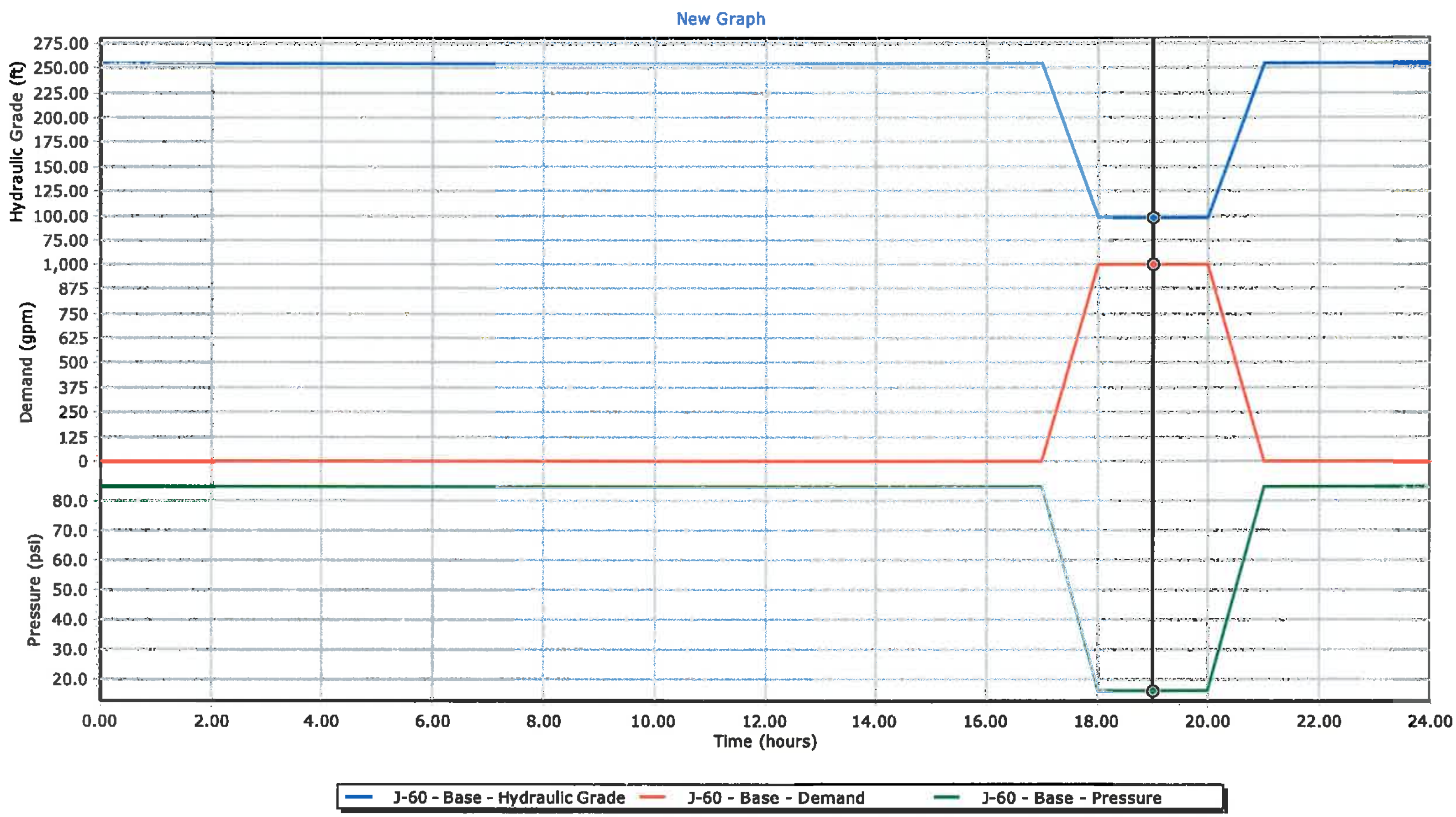
Junction Detailed Report: J-61

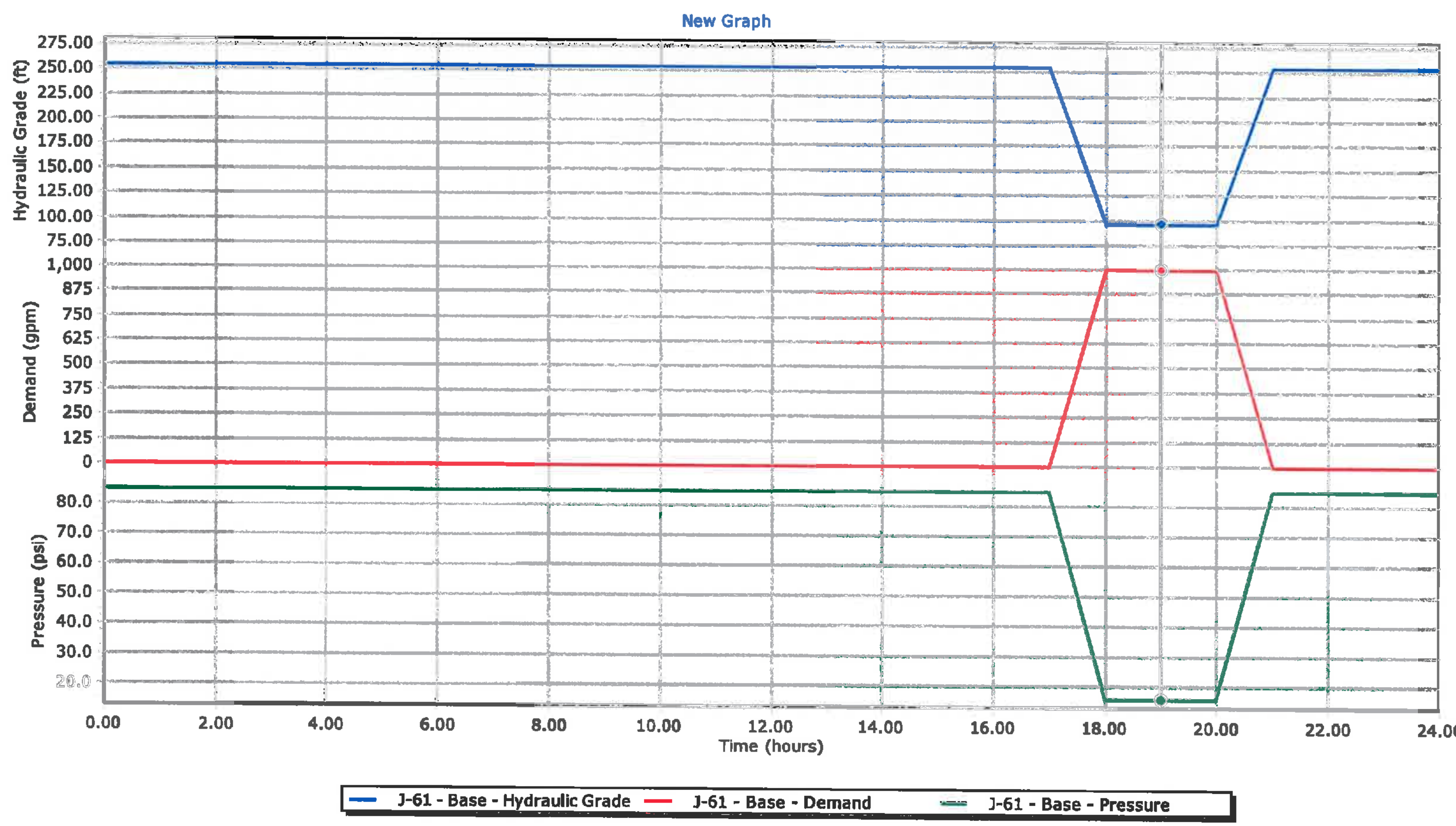
Calculated Results Summary

Time (hours)	Hydraulic Grade (ft)	Pressure (psi)	Demand (gpm)
24.000	255.50	84.6	0

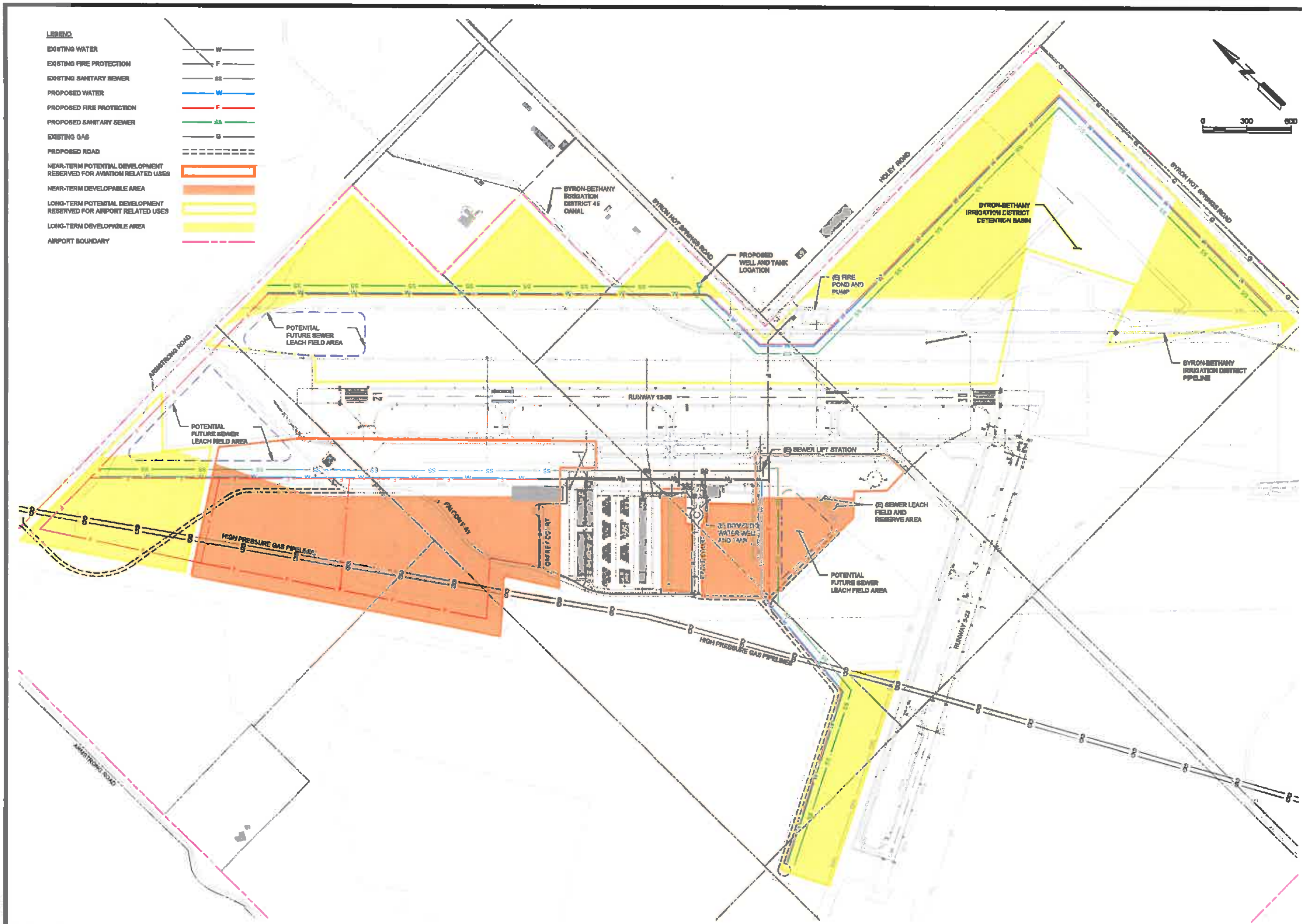


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-59 - Base - Hydraulic Grade
J-59 - Base - Demand
J-59 - Base - Pressure


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
75.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-60 - Base - Hydraulic Grade
J-60 - Base - Demand
J-60 - Base - Pressure


New Graph
Hydraulic Grade (ft)
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
75.00
Demand (gpm)
1,000
875
750
625
500
375
250
125
0
Pressure (psi)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Time (hours)
J-61 - Base - Hydraulic Grade
J-61 - Base - Demand
J-61 - Base - Pressure

Appendix D Potential Development Utility Map



Mead & Hunt

Mead & Hunt, Inc.
180 Promenade Circle,
Suite 240
Sacramento, CA 95834
phone: 916-971-3961
meadhunt.com

CONTRA COSTA COUNTY
BYRON AIRPORT
Infrastructure and Utility Analysis
500 EAGLE COURT
BYRON, CA 94514

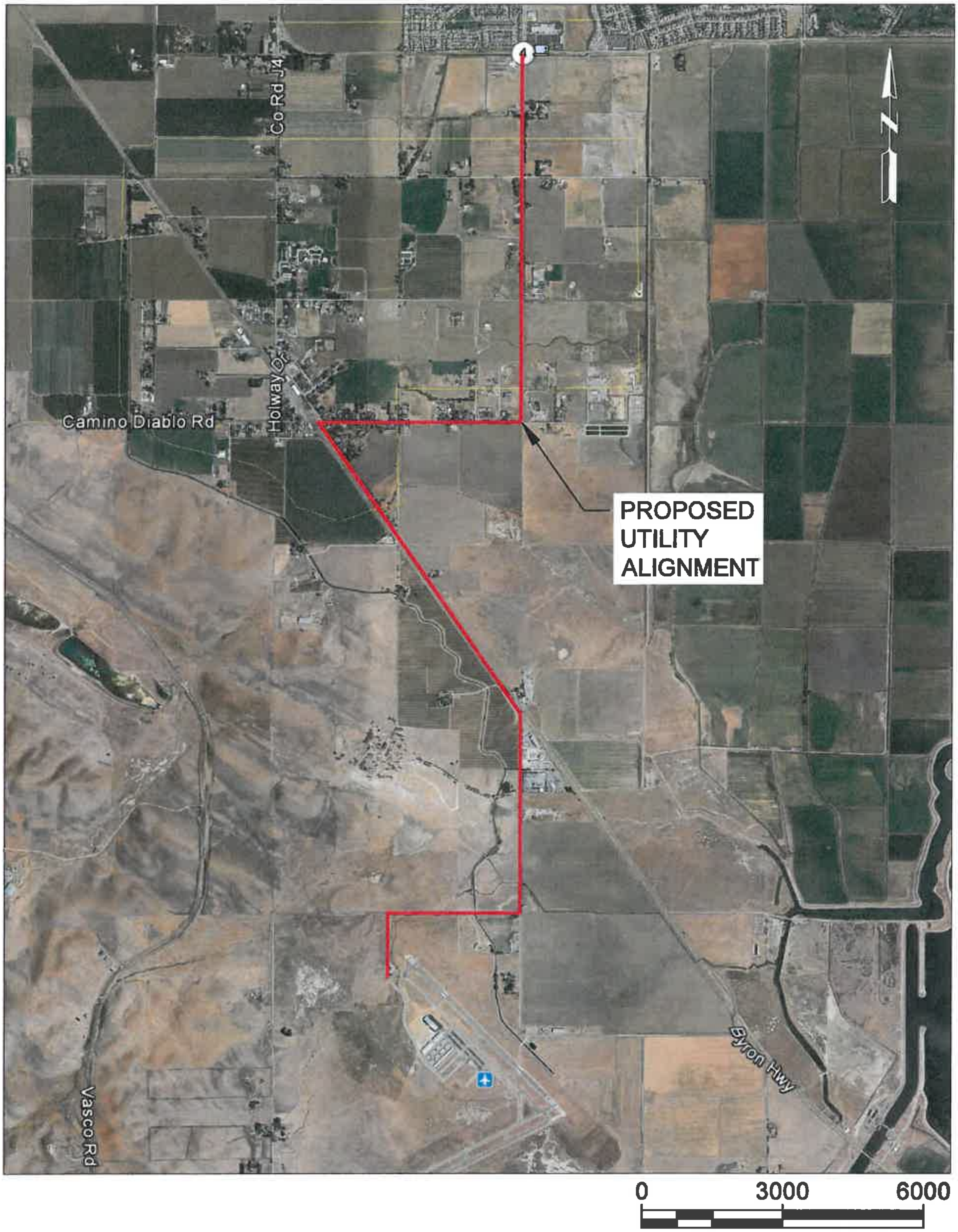
NOT FOR CONSTRUCTION

4166500-121567.00
AUG. 2013
JHK
RSS
JHK

POTENTIAL DEVELOPMENT UTILITY MAP

APPX-D

Appendix E Potential Connection to Discovery Bay Alignment



CONTRA COSTA COUNTY
BYRON AIRPORT
INFRASTRUCTURE AND
UTILITY ANALYSIS

4186500-121867.00
AUG 2013

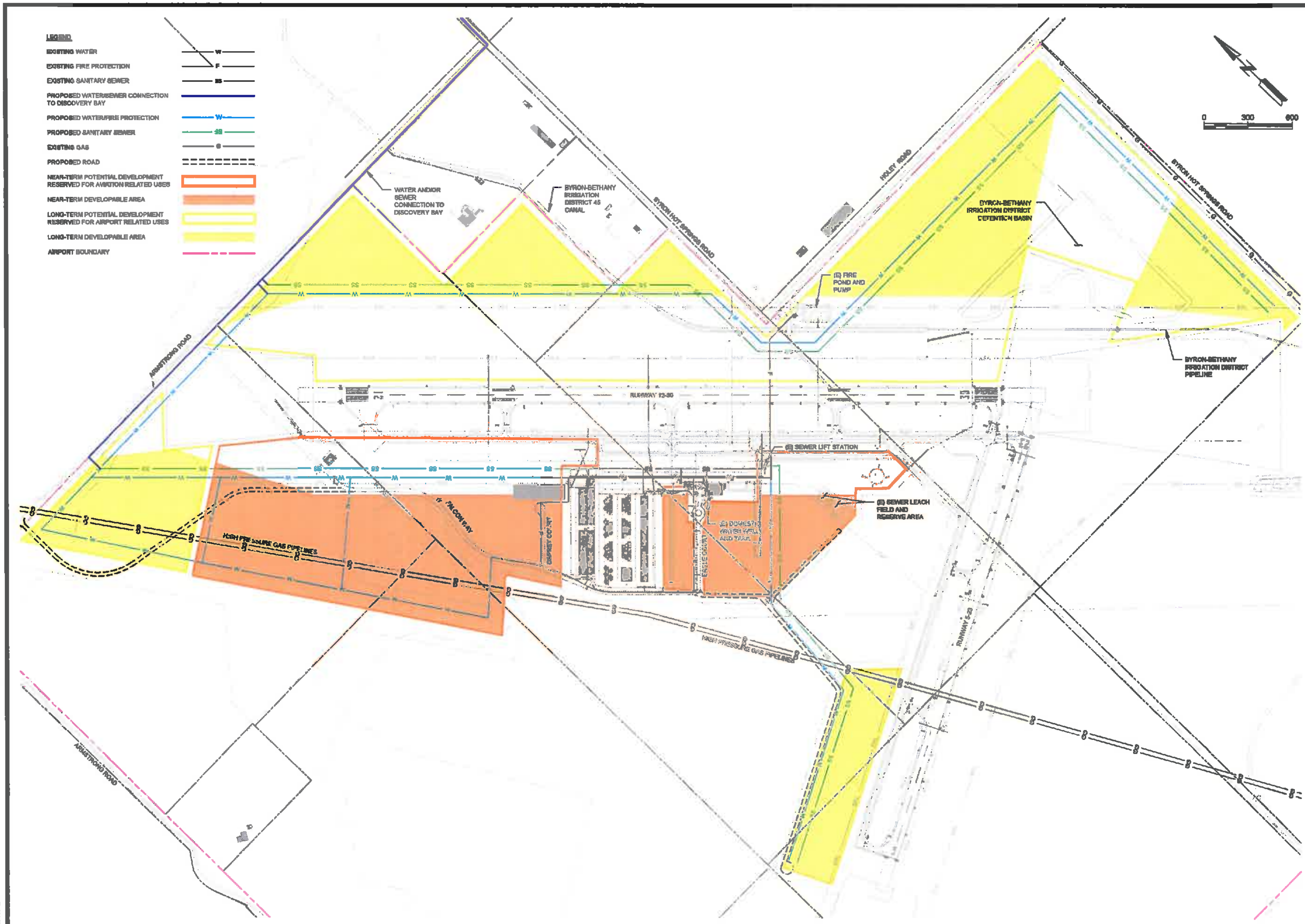
POTENTIAL CONNECTION TO
DISCOVERY BAY ALIGNMENT

Mead & Hunt

APPENDIX-E

8/5/2013 9:35:46 AM
X:\4186500\121867.00\TECH\CAD\EXHIBITS\BYRON CONNECTION TO DISCOVERY BAY.DWG

Appendix F Potential Development Utility Map – Discovery Bay Alternative



Mead & Hunt

Mead & Hunt, Inc.
180 Promenade Circle,
Suite 240
Sacramento, CA 95834
phone: 916-971-3961
meadhunt.com

CONTRA COSTA COUNTY
BYRON AIRPORT
Infrastructure and Utility Analysis

500 EAGLE COURT
BYRON, CA 94514

NOT FOR CONSTRUCTION

4166500-121867.00
AUG. 2013
JHK
RBB
JHK
DO NOT SCALE DRAWINGS

POTENTIAL DEVELOPMENT UTILITY MAP DISCOVERY BAY ALTERNATIVE

APPX-F

Appendix G Well Completion Report

ORIGINAL
File with DWR
Page 1 of 1
Owner's Well No. ______
Date Work Began 9-27-94 Ended 9-29-94
Local Permit Agency Contra Costa County
Permit No. ______ Permit Date ______

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 567864

DWR USE ONLY — DO NOT FILL IN
0 1 S 0 3 E 2 2
STATE WELL NO./STATION NO.
LATITUDE / LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION (Describe material, grain size, color, etc.)
0	7	clay-yell. org., very stiff
7	15	shale, clay-lite brn, hard
15	16	clay-yell. org., med. stiff
16	18	shale, clay-lite brn, hard
18	26	clay-yell. org., med. stiff
26	43	clay-grn. gray, soft
43	44	sand-dense .02-.003
44	49	sand stone-dense .02-.003
49	50	sand-brn. med. dense .02-.003
50	54	clay-very sandy, grn gray
54	55	sand-dense, .02-.003
55	98	sand-clay, very sandy, stiff
98	108	clay-dark gray, med. stiff
108	110	clay-very sandy, grn gray med. stiff, .02-.003
110	116	clay-dark gray, med.stiff
116	200	clay-very sandy, med. stiff grn. gray, .02-.003

TOTAL DEPTH OF BORING 200 (Feet)
TOTAL DEPTH OF COMPLETED WELL 200 (Feet)

WELL OWNER

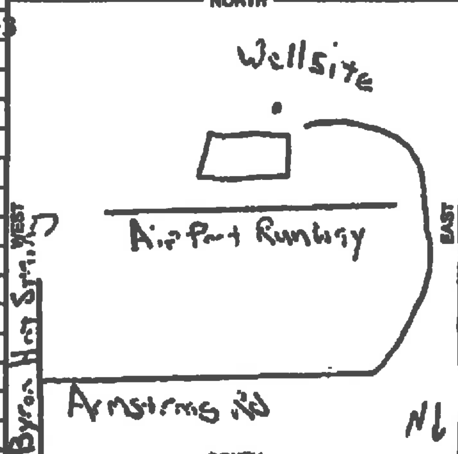
Name Contra Costa County-Public Works
Mailing Address 550 Sally Ride Drive
Concord CA 94520
CITY STATE ZIP

WELL LOCATION

Address Byron Hot Springs Road
City Byron
County Contra Costa
APN Book 001 Page 011 Parcel 013
Township ___ Range ___ Section ___
Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH



WEST / EAST / SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Mud

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___
ESTIMATED YIELD* ___ (GPM) & TEST TYPE ___
TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* *May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	50	12¼"	x				SDR-21	6"	.316"	
50	70	12¼"		x			SDR-21	6"	.316"	1/32"
70	180	12¼"	x				SDR21	6"	.316"	
180	200	12¼"		x			SDR-21	6"	.316"	1/32"

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	x			
50	200				¼" gravel

ATTACHMENTS (✓)

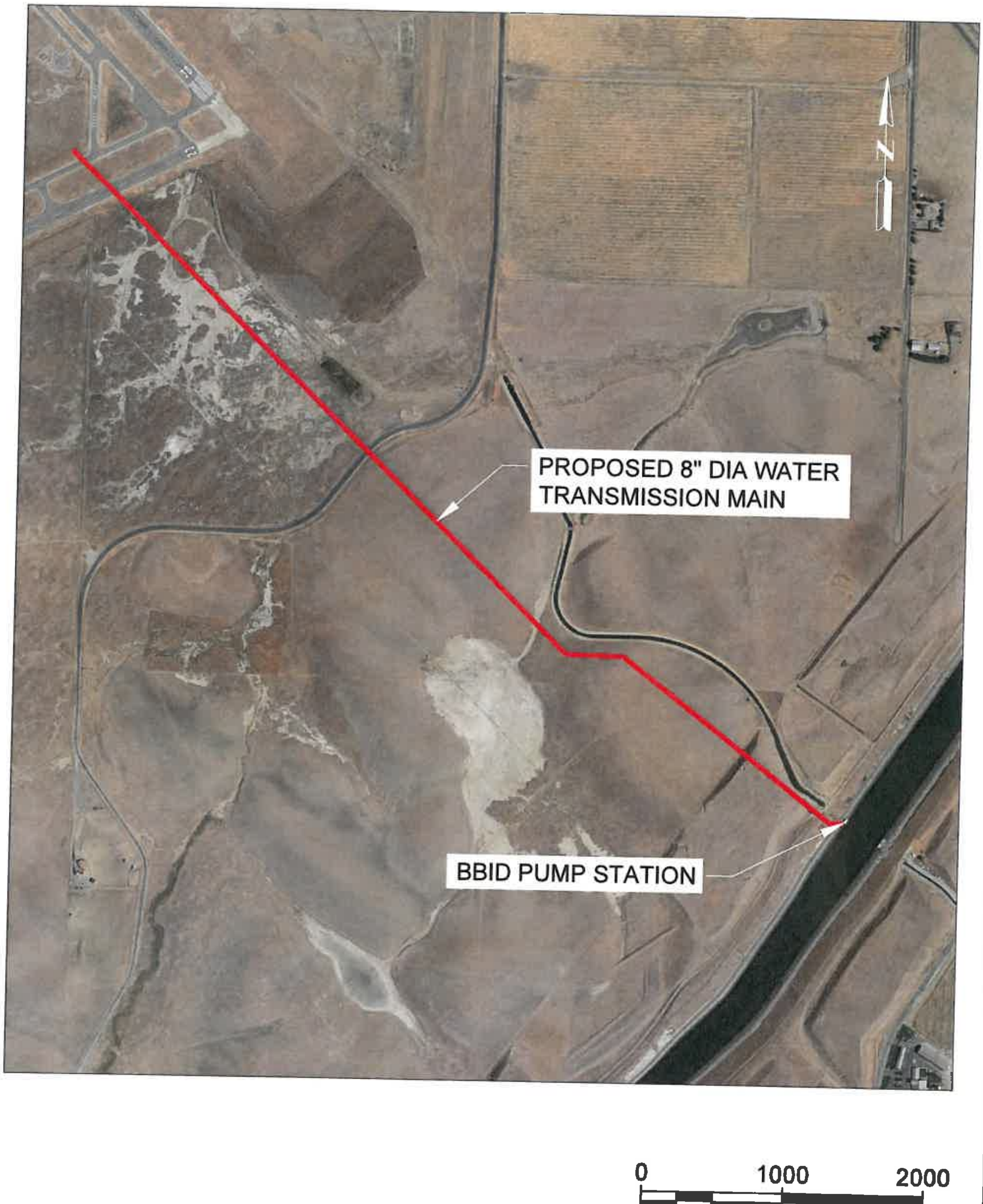
___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME Dejesus Pump & Well Drilling, Inc. 1195
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
2582 Sellers Avenue Brentwood CA 94513
ADDRESS CITY STATE ZIP
Signed [signature] 9-30-94 542644
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Appendix H Potential Connection to BBID Pump Station Alignment



CONTRA COSTA COUNTY
BYRON AIRPORT
INFRASTRUCTURE AND
UTILITY ANALYSIS

4186500-121867.00
AUG. 2013

POTENTIAL CONNECTION TO
BYRON BETHANY IRRIGATION
DISTRICT ALIGNMENT

Mead & Hunt

APPENDIX-H