MASTER DEVELOPMENT DRAINAGE PLAN

FOR

MEADOW LAKES AIRPORT AND INDUSTRIAL PARK DEVELOPMENT

October 17, 2006
Revised: April 14, 2008

Prepared for:

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Project No. 6005.0004

PENTACOR

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EXECUTIVE SUMMARY

The purpose of this Master Development Drainage Plan (MDDP) is to present conceptual drainage improvements for the Meadow Lake Airport and Industrial Park Development based on current conceptual land uses. The proposed improvements are designed to accommodate the criteria associated with the principal that water shall not be allowed to flow from the property at a rate greater than occurs under existing conditions.

The existing conditions and proposed facilities have been evaluated based upon criteria stated in the City of Colorado Springs / El Paso County Drainage Criteria Manual.

The proposed Meadow Lake Airport and Industrial Park development is located approximately 18 miles northeast of Colorado Springs, adjacent to Falcon, Colorado. The development totals 1,092 acres which will be divided between airport expansion and industrial land uses. Primary, full vehicular access to the airport is proposed from Curtis Road with limited emergency access from the north at the existing intersection of Judge Orr and Aerostar Drive. The industrial park proposed access is located on Curtis Road and Falcon Highway.

At this stage of the development process, the drainage and storm water plans are conceptual. Based on the Master Development Drainage Plan – Proposed Conditions, (Sheet 2 of 2 in Appendix D), the Meadow Lake Airport Association will be responsible for :

- Conformance to the grading plans (these will be created in a collaborative effort between the Airport Development Group and Pentacor Engineering to closely match the proposed basins)
- Construction of detention facilities: Pond 6 in Basin G, Pond 5 in Basin F, and Pond 4 in Basin A and associated outlet structures
- Culverts to transport flows under the taxiway to runway connections, new roads and new driveways
- Graded drainage swales (these will primarily follow the time of concentration lines shown on Sheet 2 of 2)
- Storm conduits that will transport flow below the proposed east-west runway
- Culverts to drain flow from Design Point 2 to Pond 2 on the RDS property

Likewise, conceptual drainage facilities for which RDS will be responsible include:

- Conformance to the grading plan
- Construction of Pond 2 and Pond 3 with associated outlet structures
- Construction of outlet channel to connect Pond 2 and Pond 3
- Culverts to transport flow under roads and driveways

ENGINEER'S STATEMENT

The attached master development drainage plan (MDDP) and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Steven Batchelder — Date

OWNER'S STATEMENT

I, the Owner, have read and will comply with all the requirements specified in the drainage report and plan.

RDS Realty Development Services

Business Name — Date

By

Title

25 N Tejon Street, Suite 300

Address

Colorado Springs, CO 80903

OWNER'S STATEMENT

I, the Owner, have read and will comply with all the requirements specified in the drainage report and plan.

Meadow Lake Airport Association

Business Name — Date

By

Title

1 Cessna Drive

Address

Peyton, CO 80831

FLOODPLAIN STATEMENT

There are portions of this development located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. 08041C0575 F, dated March 17, 1997. (See Appendix A, FEMA FIRM Exhibit). Any work that occurs within the designated floodplain

will require the approval of the Federal Emergency Management Agency (FEMA) through a CLOMR / LOMR process as well as the US Army Corps of Engineers through a Clean Water Act Section 404 permit application process.

Steven Batchelder Date

EL PASO COUNTY

Filed in accordance with Section 51.1 of the El Paso County Development Code, as amended.

John A. McCarty, P.E. Date
County Engineer/ Director

1.0 INTRODUCTION

Purpose and Scope

The purpose of this Master Development Drainage Plan (MDDP) is to provide an overview of the overall drainage impacts and required mitigation due to proposed development in the Meadow Lake Airport and Industrial Park Development. See Appendix A for vicinity map.

Property Location and Description

The proposed 1,092 acre Meadow Lake Airport and Industrial Park Development is located approximately 18 miles northeast of the City of Colorado Springs, due east of the town of Falcon, Colorado.

The proposed development consists of two sections, the northern and western portion, approximately 753 acres, encompasses the proposed Meadow Lakes Airport expansion. The south central and eastern portion of the development is the site of a proposed industrial park, occupying approximately 339 acres.

The property is bordered on the north by Judge Orr Road and a portion of the Meadow Lakes Subdivision, to the east by Curtis Road, the south by Falcon Highway and to the west by Meadow Lakes Subdivision and the Falcon Height Subdivision.

In general, the land slopes from the northwest towards the southeast. There are a couple of ridges which separate the drainage sub basins and direct runoff toward the southwest. In general, the slopes range from 0.5% to 2%.

The existing conditions at the Meadow Lake Airport portion of the development consist of a narrow asphalt runway running from a short turf runway running west to east. There are also areas for hangars, roads and outdoor aircraft parking. The existing airport has some drainage swales, channels and culverts.

The proposed development includes improvements to the existing facilities such as extending the existing north-south runway, constructing new taxiways, tarmac and hangers as well as a new east-west paved runway.

The industrial park portion of the development currently is covered with grasses and some riparian vegetation. Proposed development includes industrial buildings, pavement, curb & gutter, and drainage facilities. The existing area drains naturally to an existing swale, a portion of which has the 100-year floodplain identified by FEMA on the FIRM (Flood Insurance Rate Map Panel No. 08041C0575 F, dated March 17, 1997. (See Appendix A, FEMA FIRM Exhibit).

The primary, full access to the airport site will be gained from the east via Curtis Road, along with existing access from Judge Orr Road onto Cessna Drive. There will also be a limited emergency access from Judge Orr Road onto Aerostar Drive. Access to the industrial park will be from both Curtis Road and Falcon Highway. Local and collector roads with curb & gutter will be constructed for access throughout both areas. The current zoning of the site is RR3 (rural residential 5 acres) and R4 (planned development).

The Natural Resource Conservation Service (NRCS) classifies the soils within the Meadow Lakes Airport and Industrial Park Development as: 61% are Blakeland loamy sand (1 to 9 percent slopes, hydrologic soil group A), 22% are Columbine gravelly sandy loam, (0 to 3 percent slopes, hydrologic soil group A), 9% are Stapleton sandy loam (3 to 8 percent slopes, hydrologic soil group B), 7% are Fluvaquentic Haplaquolls (nearly level, hydrologic soil group D) and the remaining 1% is identified as water. Excerpts from the NRCS "Soil Survey of El Paso County Area, Colorado" are provided in Appendix A for further reference [3].

There are some existing wetlands and areas of high ground water with the potential for wetlands on the site as depicted on the existing wetlands map included in Appendix A. Final determination and mitigation of these areas shall be completed with the local Army Corp of Engineers under a 404 permit at the time of final design.

2.0 DRAINAGE DESIGN CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County *Drainage Criteria Manual, Volume 1* [1], the City of Colorado Springs *Drainage Criteria Manual, Volume 2* [2], the El Paso County *Engineering Criteria Manual* [4], and the Urban Drainage and Flood Control District (UDFCD) *Urban Storm Drainage Criteria Manual, Volumes 1,2, and 3* [5]. No deviations from these published criteria are requested for this site.

There are no drainage basin planning studies completed at this time that cover the area of this development. The unnamed drainage shown on FEMA FIRM map for this development area will need to be altered as part of this development. The alteration process will be performed through FEMA, the US Army Corps of Engineers and the Pikes Peak Regional Building Department, while also adhering to all county and state drainage requirements.

The Rational Method as outlined in Section 3.2.8.F of the El Paso County *Engineering Criteria Manual* [4] was used for basins less than 100 acres to determine the rainfall and runoff conditions for the existing conditions and proposed development of the site. For basins larger than 100 acres, the SCS method was used with a design storm of 24 hours. The runoff rates for the 10-year initial storm and 100-year major design storm were calculated.

3.0 EXISTING HYDROLOGICAL CONDITIONS

At the Meadow Lake Airport expansion portion of the development, the general topography flows from the northwest towards the southeast. Asphalt surfaces are sloped to facilitate the collection of runoff into roadside ditches and culverts. Runoff is directed through the ditches and culverts toward the southeast where existing ponds collect the water. A natural channel flows from the largest pond and traverses the industrial park site in a southerly direction. This area discharges under Falcon Highway through an existing bridge with an opening of approximately 5.5' High x 24' Wide.

There is a second area of runoff (in the airport portion) that flows in a northeast to southwest direction. This area is on the western portion of the site, generally to the south and west of the existing runway. Runoff from this area naturally collects into an existing swale and exits the property to the south under Falcon Highway, through an existing 36" x 46" CMP arch pipe culvert.

The existing area of the proposed industrial park drains naturally to an existing channel. The channel, or small ephemeral brook, is mapped as an unidentified stream without a detailed study by the Federal Emergency Management Agency (FEMA) as part of the National Flood Insurance Program (NFIP). A portion of the Flood Insurance Rate Map Panel 0575F is attached to this report.

There are three (3) major basins which the Meadow Lake Airport development lie within. Most of the site is within the Solberg Ranch Basin. Two (2) relatively small sub basins (EX-2 and EX-7) are within the Haegler Ranch Basin and drain off-site to the northeast. Another relatively small sub basin (EX-14) is in the Curtis Ranch Basin and flows off-site to the southwest. The sub basins used to evaluate the existing conditions hydrology and hydraulics are discussed below (see appendix D for basin delineations).

Below is a discussion of all of the existing basins and design points:

Basin OS-1
This basin lies west of the site and drains to the southeast into existing basin EX-1. This basin consists of rural residential development (approximately 5 acre lots) and drains as sheet flow to the southeast onto existing on-site Basin EX-1. Flows for this basin are estimated to be 30.6 and 60.3 cfs for the 10 and 100-year storm events, respectively.

Basin OS-2
This basin includes most of the commercial area located just east of the existing paved runway. This basin contains hangars and roadways, and the surface is approximately 80% impervious. It drains southeast into an existing channel and is conveyed towards the south through culverts into a small pond. The existing pond discharges into Basin EX-4. Undetained flows for this basin are estimated to be 151.9 and 262.2 cfs for the 10 and 100-year storm events, respectively.

Basin OS-3
This basin includes the remainder of the existing developed airport area (hangers, maintenance facilities, aircraft storage) and the surface is approximately 80% impervious. This basin flows overland to the southeast to an existing small pond at the southeast corner of the basin at existing design point 1. The pond discharges into existing Basin EX-5. Undetained flows for this basin are estimated to be 63.6 and 110.2 cfs for the 10 and 100-year storm events, respectively.

Basin OS-4
This Basin consists of rural residential lots (5 acres+) to the north and east of the existing airport site. This basin drains overland in shallow swales to the existing small pond in Basin OS-3. This basin discharges through the existing pond into existing on-site Basin EX-5. Undetained flows for this basin are estimated to be 47.2 and 92.4 cfs for the 10 and 100-year storm events, respectively.

Basin OS-5

This basin lies along the west property line of the site. The basin flows overland primarily as sheet flow to the east onto existing on site Basin EX-11. This basin consists of rural residential development (5 acres+ lots) with no paved roads. Flows for this basin are estimated to be 240.1 and 340.8 cfs for the 10 and 100-year storm events, respectively.

Basin OS-6

This small basin lies east of the site and drains as sheet flow onto existing on site Basin EX-5. This basin consists of a portion of a rural residential lot (5 acres+). Flows for this basin are estimated to be 1.3 and 2.7 cfs for the 10 and 100-year storm events, respectively.

Basin OS-7

This basin lies along the west property line of the site. The basin flows overland as sheet flow to the east onto existing on-site basin EX-3. This basin consists of rural residential lots (5 acres+). Flows for this basin are estimated to be 21.2 and 42.9 cfs for the 10 and 100-year storm events, respectively.

Basin EX-1

This basin is the largest on-site basin. Runoff from this basin flows from the northwest corner of the property, from the existing runway, down through the center of the property. Flow from this basin eventually reaches the ephemeral channel on the industrial park portion of the development. Runoff from OS-1 enters this basin along the northwestern property line. This basin drains flows from the existing runway as well as all of the undeveloped meadow to the west and south of the runway. The main conveyances of flow for this basin are small overland flow paths and natural swales. Flows for this basin are estimated to be 90.2 and 128.0 cfs for the 10 and 100-year storm events, respectively.

Basin EX-2

This small basin is located on the eastern side of the property, on the side of a small east-facing hill. Thus, flows drain off-site towards the east and are intercepted by the existing drainage swale along Curtis Road. This basin is an undeveloped portion of the property, so the native ground cover is prominent. Flows for this basin are estimated to be 9.3 and 19.6 cfs for the 10 and 100-year storm events, respectively.

Basin EX-3

This small basin is located along the western boundary, near the center of the property, west of Basin EX-1. It is undeveloped meadow that accepts flows from basin OS-7. Runoff flows southeasterly from this basin off the property, through a corner of basin OS-5, which promptly drains back onto the property into Basin EX-11. Flows for this basin are estimated to be 16.2 and 33.8 cfs for the 10 and 100-year storm events, respectively.

Basin EX-4

This basin is located near the center of the property, there is an existing pond located directly north of this basin. On-site runoff flows across undeveloped meadow to an existing large pond at the southeast of the basin. Flows from Basin OS-2 enter this basin through an existing pond. Flows for this basin are estimated to be 35.5 and 72.6 cfs for the 10 and 100-year storm events, respectively.

Basin EX-5

This basin is located to the south of the developed part of the airport. Flows from offsite basins OS-3 and OS-4 enter the property at the northern portion of this basin. A grass runway located near the northern end of this basin drains flows from the west to the east. The remainder of the basin is undeveloped meadow which drains southerly to an existing large pond at the south end of the basin. Flows for this basin are estimated to be 102.5 and 145.5 cfs for the 10 and 100-year storm events, respectively.

Basin EX-6

This basin is located to the east of EX-1 and west of EX-4. Runoff from this basin flows over natural meadow from the northwest towards the southeast. The downstream most portion of this basin is located along the existing ephemeral channel located downstream of the large pond on-site. Flows for this basin are estimated to be 29.4 and 61.9 cfs for the 10 and 100-year storm events, respectively.

Basin EX-7

This basin is located in the northeast corner of the industrial park portion of the property. The basin is similar to basin EX-2 as it is located on the eastern side of a small hill, with east flowing runoff. This basin drains flows across undeveloped meadow off-site to the east where flows are intercepted by the existing drainage swale along Curtis Road. Flows for this basin are estimated to be 26.2 and 55.4 cfs for the 10 and 100-year storm events, respectively.

Basin EX-8

This basin is located near the center of the property on the western facing steeper part of a hill. It is bounded to the west by an ephemeral stream, stemming from the large pond at the center of the property. This basin drains flows off the undeveloped hill into the stream. Flows for this basin are estimated to be 16.0 and 34.0 cfs for the 10 and 100-year storm events, respectively.

Basin EX-9

This basin is located at the southeastern part of the property, and is bounded to the east by a road and to the west by the ridge of a hill. The hill slopes east, with runoff flowing east to the existing swales along Curtis Road. The basin is undeveloped and consists of natural meadow. Flows along the west side of Curtis Road flow southerly to the intersection with Flacon Highway and thence west along Falcon Highway to the existing natural drainage way in Basin EX-13. Flows for this basin are estimated to be 22.4 and 46.4 cfs for the 10 and 100-year storm events, respectively.

Basin EX-10

This basin is located near the southeastern part of the property on the side of an undeveloped hill opposite to basin EX-9 and below basin EX-8. Runoff flows towards the west to the ephemeral stream bordering the basin to the west. Flows for this basin are estimated to be 17.7 and 37.9 cfs for the 10 and 100-year storm events, respectively.

Basin EX-11

This is a large basin located at the southwest corner of the property. Runoff from off-site basin OS-5 enters this basin from the west. Runoff from off-site Basin OS-7 and on-site Basin EX-3 enter this basin from the north. The runoff travels over natural meadow to shallow swale that leaves exits the property to the south under Falcon Highway, in an

existing 36" x 46" CMP arch pipe culvert. Flows for this basin are estimated to be 102.4 and 145.4 cfs for the 10 and 100-year storm events, respectively.

Basin EX-12

This basin is located at the south-central part of the property, on undeveloped land. It is bordered to the south by Falcon Highway, to the west by the ridge of a hill, and to the east by an ephemeral stream. This basin collects flows that travel over land to the stream, which exits the basin and the property under Falcon Highway. Flows for this basin are estimated to be 50.2 and 105.2 cfs for the 10 and 100-year storm events, respectively.

Basin EX-13

This basin is located at the southeastern part of the property, and is bounded to the north and east by ridges, to the south by Falcon Highway, and to the west by an ephemeral stream. The basin is located across the stream from Basin EX-12. The runoff from this undeveloped basin flows to the stream, where it exits the basin and the property under Falcon Highway. Flows for this basin are estimated to be 22.4 and 46.7 cfs for the 10 and 100-year storm events, respectively.

Basin EX-14

This basin is located at the southwest corner of the site and flows in a southerly direction to the roadside ditch along Falcon Highway and thence to the west in the roadside ditch. Flows for this basin are estimated to be 4.3and 9.0 cfs for the 10 and 100-year storm events, respectively.

Design Point 1

This design point is located at a small pond located just north of the property. This design point is where basins OS-3 and OS-4 converge. The runoff from this design point releases on-site to basin EX-5, eventually reaching Design Point 2. Flows for this design point are estimated to be 82.8 and 147.9 cfs for the 10 and 100-year storm events, respectively.

Design Point 2

This design point is located at the outlet of the second, larger pond along this flow path in the central part of the property. This design point includes flows directly from basins EX-4 and EX-5, and is a collector of flows from Design Point 1and Basin OS-2. The outflow from this design point is an ephemeral stream flowing southeast. Flows for this design point are estimated to be 200.1 and 368.1 cfs for the 10 and 100-year storm events, respectively.

Design Point 3

This design point is located further down the ephemeral stream, south of Design Point 2, where Basins EX-6 and EX-8 converge. This basin accepts flows directly from these 2 basins as well as routed flows from Design Point 2. Flows for this design point are estimated to be 230.7 and 433.2 cfs for the 10 and 100-year storm events, respectively.

Design Point 4

This design point is located further down the ephemeral stream, south of design point 3, and is closer to the southeastern part of the property, where basins EX-1 and EX-10 converge. This design point accepts flows directly from these two basins, as well as flows from Design Point 3 and off-site Basin OS-1. Flows from Design Point 2 were

routed through the channel and added to flows from Basins EX-1, EX-10 and OS-1 at this location. Flows for this design point are estimated to be 250.3 and 479.6 cfs for the 10 and 100-year storm events, respectively.

Design Point 5

This design point is located at the southeastern part of the property, where basins EX-12 and EX-13 converge and where the ephemeral channel leaves the property under Falcon Highway. This is the final design point that collects flows from the ephemeral stream, downstream of Design Point 4. Flows from Design Point 4 were routed through the channel and added to flows expected from EX-12 and EX-13. Historic flows discharge through an existing bridge/culvert (approximately 5.5'H x 24'W x 50'Long). This existing bridge will pass the existing 100-yr flow at an approximate depth of 4.57 feet. The existing structure consists of 2 sheet pile abutments with steel beams and deck covered with asphalt pavement. This bridge will have to be replaced if Falcon Highway is to be widened for this project. Flows for this design point are estimated to be 320.7 and 634.8 cfs for the 10 and 100-year storm events, respectively.

Design Point 6

This design point is located along the west property line at the north end of Basin EX-11. This design point combines runoff from off-site Basin OS-7 and on-site Basin EX-3. Flows for this design point are estimated to be 29.5 and 60.2 cfs for the 10 and 100-year storm events, respectively.

Design Point 7

This design point is located on the southern boundary to west of Design Point 5. Flow at this location includes offsite runoff from OS-5 as well as routed flows from Design Point 6 and contributing flows from EX-11. A shallow ephemeral channel exists in EX-11 and exits the property under Falcon Highway at this design point. An existing 36" x 46" corrugated metal arch pipe conveys flows under Falcon Highway. The culver is currently 80% blocked with sediment and does not function as intended. Even when modeled as unblocked this culvert does not have the capacity to convey the existing flow for the 10 or 100-year storm events of 265.7 and 378.8 respectively without overtopping the roadway. This culvert will have to be replaced with a larger culvert in the first phases of this project.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Proposed development at the airport includes the expansion of the existing runway (aligned northwest to southeast), the development of a second paved runway (aligned east to west), and associated taxiways, aprons, and hangars, access and collector roads. The industrial park development includes approximately 7 parcels for industrial development including access roads bisecting the property.

While detailed proposed grading has not been performed for this report, it is anticipated that the proposed conditions will create different drainage basin than are observed under existing conditions. General drainage patterns are indicated by grey arrows shown on page 2 of 2 in Appendix D. The hydrology of the basins and design points of proposed conditions are discussed below.

The Off-site flows that affect the development have been delineated into seven (7) sub basins; four (4) basins are located in the northern portion of the site and the other three (3) contribute flows to the site from the west. Flows from property to the north of the development are directed along Judge Orr Road and do not affect this site. Off-site flows will be routed through the site via grass lined swales, culverts and a constructed channel to the appropriate detention ponds before exiting the property.

For a development this large, the project will have to be phased. Phasing plans will need to be prepared with the construction documents for the site, but in general, any downstream drainage facilities will need to be in place and operational before the upstream development is constructed.

Below is a discussion of all of the developed basins and design points:

Basin OS-1
Changes to this off-site basin are not expected as part of this project. Therefore the discussion in the existing conditions applies to proposed conditions as well.

Basin OS-2
A slight change in the basin will eliminate the small area of this existing basin that is south of the existing east west runway and includes an existing pond to be eliminated. Flows for this basin are estimated to be 142.3 and 245.6 cfs for the 10 and 100-year storm events, respectively.

Basins OS-3 – OS-7
Changes to these five (5) off-site basins are not expected as part of this project. Therefore the discussion in the existing conditions applies to proposed conditions as well.

Basin A1
Basin A1 is located along the western edge of the project above Basin A2. This basin includes approximately the west half of the proposed north south runway, along with associated taxiways, aprons and hangars. It is assumed that the runway will be crowned such that half the runoff flows towards the southwest in Basin A1 and half will flow towards the southeast in Basin D1b. Runoff between the runway and taxiway will be conveyed in a shallow swale and under taxiway/runway connections through culvert pipes. These flows along with flows from off-site Basin OS-7 will be conveyed to Basin A2. Flows for this basin are estimated to be 118.9 and 206.9 cfs for the 10 and 100-year storm events, respectively.

Basin A2
Basin A2 is located along the western edge of the project. This basin includes approximately one-half of the proposed runway expansion, along with associated taxiways, aprons and hangars. It is assumed that the runway will be crowned such that half of the runoff will flow towards the southwest in Basin A2 and the other half will flow towards the southeast in Basin D1b. Runoff between the runway and taxiway will be conveyed in a swale and culverts will be used to convey the flow under the paved sections joining the taxiway and the runway. Concentrated flows at the southern end of the runway will be discharged into Pond 4. The flow in the remaining portions of this basin will be directed toward the south and into Pond 4. Offsite flow from basin OS-5 will enter this basin along the western property line. These flows will be conveyed

through swales and culverts to the existing swale and Pond 4. Also the small existing basin, EX-14 which historically flows off-site to the southwest will be included in Basin A2 and directed toward Pond 4. Flows for this basin are estimated to be 527.7 and 749.0 cfs for the 10 and 100-year storm events, respectively.

Basin B

This is a small basin at the center of the property and includes the entire east-west aligned proposed runway, as well as the associated taxiways, aprons and hangars for the runway. The open area between the runway and taxiways will be used as a conveyance for the runoff from this basin. The grading for the runway will call for approximately 45 feet of fill at the maximum, essentially over the existing drainage way. This basin is therefore perched, especially towards the center of the basin. Flows for this basin are estimated to be 62.6 and 110.5 cfs for the 10 and 100-year storm events, respectively.

Basin C1

This basin is zoned for commercial space; proposed plans include parking lots, roads, curb & gutter, buildings, as well as some tarmac and hangers. The western part of the basin will be mostly impervious. The eastern and northern parts are zoned commercial. This basin intercepts flows from offsite basins OS-3 and OS-4 and conveys all the flows to the south. Flows from this basin will be directed southward through a series of large storm conduits under the proposed east-west runway. These flows will empty into the proposed detention Pond 2. Flows for this basin are estimated to be 575.6 and 817.0 cfs for the 10 and 100-year storm events, respectively.

Basin C2

This basin is located to the center of the property, and is zoned for commercial use. The southern part of the basin is in the planned industrial development, to the southeast of Meadow Lake Airport. Runoff from Basins B and C1 flows onto this Basin from the north through a series of conduits that will be constructed under the proposed east-west runway. Pond 2 is a large detention pond proposed to be constructed at the southern end of this basin. Flows for this basin are estimated to be 130.3 and 230.8 cfs for the 10 and 100-year storm events, respectively.

Basin D1a

This basin runs from the northwest corner of the property to the north end of the proposed north south runway. This basin will have some airport type (tarmac, hangers, etc) development in an open area for runway approach. This basin will drain through a culvert into Basin D1b between the runway and taxiway. Flows for this basin are estimated to be 86.0 and 150.0 cfs for the 10 and 100-year storm events, respectively.

Basin D1b

This is a large basin that runs from Basin D1a to the south includes the other half of the proposed runway (opposite of Basins A1 and A2) as well as some developed commercial space and some open space to the south. The basin collects flows from offsite basin OS-1 and conveys onsite flows from D1b mostly via swales and culverts to Pond 3, located at the southeastern end of the basin and property. Flows for this basin are estimated to be 394.4 and 559.8 cfs for the 10 and 100-year storm events, respectively.

Basin D2

This basin is located in the northwest part of the proposed industrial development. It is zoned industrial and includes some access roads. Runoff will flow towards the east – southeast to a proposed drainage swale at the center of the property. Flows for this basin are estimated to be 79.9 and 136.8 cfs for the 10 and 100-year storm events, respectively.

Basin D3

This basin is located in the northeast corner of the proposed industrial area and is zoned industrial with roads. Flows from this basin will head southwest and drain into a proposed channel at the center of the property. Flows for this basin are estimated to be 184.7 and 316.1 cfs for the 10 and 100-year storm events, respectively.

Basin D4

This basin is also located in the proposed industrial area in the southeast corner of the development. It is zoned industrial and flows will head west – southwest towards the proposed channel. Flows for this basin are estimated to be 233.6 and 402.0 cfs for the 10 and 100-year storm events, respectively.

Basin F

This basin is located to the east of the property, and drains flows offsite to the east. It is planned for some commercial use and roads. Flows will be conveyed to Pond 5 for detention before draining off site. A cutoff channel is necessary to direct flow to the pond before reaching the Curtis Road right-of-way. Released runoff from Pond 5 will be at or below historic rates and will flow in the roadside ditch along Curtis Road to the north. Flows for this basin are estimated to be 78.6 and 121.0 cfs for the 10 and 100-year storm events, respectively.

Basin G

This basin is also located on the eastern side of the airport development, to the north of the entrance from Curtis Road, and drains towards the east. This basin is zoned for commercial development. Flows from this basin will be directed to detention Pond 6 and released flow will be at or below historic rates and will be spread and discharged to the northeast away from the existing homes. Flows for this basin are estimated to be 60.1 and 92.3 cfs for the 10 and 100-year storm events, respectively.

Design Point 1

This point is where basins OS-3 and OS-4 converge. It is located directly to the north of the property. The undetained flows for this design point are estimated to be 82.8 and 147.9 cfs for the 10 and 100-year storm events, respectively.

Design Point 2

This point is downstream of Design Point 1, where the flows from Basin C1 converge with the runoff from Basins OS-2, OS-3 and OS-4. This point is located near the center of the development, just upstream of where flows are routed through culverts to Pond 2. Flows for this design point are estimated to be 575.6 and 817.0 cfs for the 10 and 100-year storm events, respectively.

Design Point 3

This point is located downstream of design point 2, at the inlet of Pond 2. Basins B and C2 contribute flows to this point as well as flows from Design Point 2. Pond 2 is very large and therefore will detain a large portion of the upstream runoff. Flows from the

pond will be released into a grass lined outflow channel that will convey the flows downstream and eventually offsite. The channel will also collect and convey flows from downstream basins. Flows for this design point are estimated to be 575.4 and 816.9 cfs for the 10 and 100-year storm events, respectively.

Design Point 4

This point is located near the center of the proposed industrial park, on the outflow channel at the downstream end of Basins D2 and D3. Flows are routed in the outflow channel from Design Point 3, and added to the runoff generated from Basins D2 and D3 at this design point. Flows for this design point are estimated to be 264.9 and 453.9 cfs for the 10 and 100-year storm events, respectively.

Design Point 5

This point is located on the southern end of Basin D1a. Flows from Basin D1a are combined with flows from Basin OS-1 and routed through Basin D1b. Flows for this design point are estimated to be 107.9 and 193.3 cfs for the 10 and 100-year storm events, respectively.

Design Point 6

This point is located at the southern and eastern end of the development just upstream of where the existing ephemeral stream crosses under Falcon Highway. Design Point 6 combines flows from Design Points 4 and 5 as well as flows from Basins D1b and D4. These flows are routed through Pond 3. Flows for this design point are estimated to be 450.5 and 736.7 cfs for the 10 and 100-year storm events, respectively.

Design Point 7

This point is located at the upper 3rd of the proposed north-south runway and combines flows from Basins D1a and OS-7. Flows from this point are routed through Basin A2 to Pond 4. Flows for this design point are estimated to be 134.0 and 237.3 cfs for the 10 and 100-year storm events, respectively.

Design Point 8

This point is located at the southern and western end of the development just upstream of where the runoff from the western portion of the development crosses under Falcon Highway, at the downstream end of Basin A2. This design point includes flow from Basin A1, which also intercepts flow from offsite Basin OS-7 and Basin A2, which also intercepts flow from Basin OS-5. The combined flows are routed through Pond 4 in order to maintain existing conditions flow rates. Flows for this design point are estimated to be 645.2 and 923.3 cfs for the 10 and 100-year storm events, respectively.

5.0 DETENTION PONDS

There are five (5) detention ponds proposed for this development scattered throughout the property, mainly concentrating towards the lower and eastern portions of the proposed development. The purpose of the ponds is to detain proposed flows and release the flows at a rate equal to or less than existing conditions. The ponds have been sized for the 100-year storm. The outflow from the ponds will be controlled with outlet pipes with their inverts at the bottom of the ponds which will act as orifices to control the flow for both the 10 and 100-year events. The program Hydraflow Hydrographs 2004 was utilized to route the developed flows into and through the

detention ponds and culverts (see appendix B). Emergency spillways shall be provided within the 2 feet of required freeboard and sized to accommodate the 100-year inflow to the pond. All ponds are designed to account for storage and also for water quality. Please see the table at the end of this section for pond information. The ponds as well as open space areas will be owned and maintained by either the Meadow Lake Airport Association or a Property Owners Association for the Industrial Park. Below is a discussion of each pond:

Pond 1A and 1B – NOT USED

These two ponds used to be located within Basin B, but it was determined that they were unnecessary to reduce the peak inflow into Pond 2.

Pond 2

This is detention facility is located within Basin C2, just south and much lower in elevation than the proposed east-west runway. A series of culverts will be constructed under the runway to transport flows from the upstream side (Design Point 2) to Pond 2. In addition to the flows from the culverts, Pond 2 will collect and detain flows directly from Basins B and C2. The pond has a total surface area of 11.4 acres at a maximum depth of 5 ft, which results in a storage of 52.7 Ac-ft. The outflow from this pond will be controlled by two (2) 36" pipes and released to the outflow channel that bisects the industrial park portion of the development.

Pond 3

This pond is close to the southern property line near the center of the proposed industrial park, south of Basin D4 and east of Basin D1. This pond is designed to detain flows from Basins D2, D3, D4, D1a, and D1b. The historic flows at this location are estimated to be 320.7 and 634.8 cfs in the 10 and 100-year storm events respectively. The proposed release rates from the pond are under the historic rates and are estimated to be 288.2 and 438.5 cfs for the 10 and 100-year storm events respectively. The outflow from the pond will be controlled by four (4) 48" pipes and will be released from the pond into the outflow conveyance channel just upstream of the bridge under Falcon Highway. The pond has a total detention of 31.5 Ac-ft, at a depth of 6 feet and a surface area of 6.1 acres.

Pond 4

This pond is located close to the southern property line, near the center of the airport expansion portion of the proposed development, in Basins A1 and A2. Runoff from Basin A1 and A2 and offsite Basins OS-7 and OS-5 will be directed into Pond 4 and then released to the south under Falcon Highway and off the site. The historic flows at this location are estimated to be 265.7 and 378.8 cfs in the 10 and 100-year storm events respectively. The proposed release rates from the pond are less than the historic rates and are estimated to be 213.4 and 299.0 cfs for the 10 and 100-year storm events respectively. The outflow from the pond will be controlled by four (3) 42". The pond has a total surface area of 10.3 acres and a maximum depth of 6.5 feet with a total storage of 58.1 Ac-ft.

Pond 5

This pond is also located near the middle of the property towards the eastern property line within Basin F. The historic flows at this location are estimated to be 26.2 and 46.4 cfs in the 10 and 100-year storm events respectively. The proposed release rates from the pond are less than the historic rates and are estimated to be 20.9 and 44.2 cfs for

the 10 and 100-year storm events respectively. The outflow from the pond will be controlled by a 36" pipe and released toward the east to the existing drainage swale along Curtis Road. This pond has a maximum volume of 1.5 Ac-ft at a maximum depth of 4 feet and a surface area of 0.7 acres.

Pond 6

This pond is located at the northeast part of the property in Basin G. The historic flows at this location are estimated to be 9.3 and 19.6 cfs in the 10 and 100-year storm events respectively. The proposed release rates from the pond are less than the historic rates and are estimated to be 8.8 and 17.8 cfs for the 10 and 100-year storm events respectively. The outflow from the pond will be controlled by a 24" pipe and released around the existing houses to the east of the pond. At a maximum depth of 3 feet and a surface area of 0.6 acres this pond has a total of 1.1 Ac-ft of storage.

DETENTION POND DATA SUMMARY

Pond ID	WQCV (Ac-ft)	10-yr Peak Inflow (cfs)	10-yr Release (cfs)	10-yr Required Volume (Ac-ft)	100-yr Peak Inflow (cfs)	100-yr Release (cfs)	100-yr Required Volume (Ac-ft)	100-yr Max Depth (ft)	Total Required Volume (Ac-ft)
2	7.25	575.4	76.6	36.88	816.9	118.6	52.67	5.0	59.92
3	10.63	450.5	288.2	23.58	736.7	438.5	31.50	6.0	42.13
4	6.84	645.2	213.4	41.67	923.3	299.0	58.06	6.5	64.90
5	0.81	78.6	20.9	1.03	121.0	44.2	1.49	4.0	2.30
6	0.55	60.1	8.8	0.70	92.3	17.8	1.05	3.0	1.60

6.0 CULVERTS AND STORM SEWER SYSTEMS

Currently the site has few existing culverts or storm sewer systems. All of the proposed roads within the site will have curb & gutter per the county's standard cross sections. Inlets and storm sewers shall be utilized to collect street runoff in accordance with the capacity requirements outlined in the DCM and routed to the appropriate downstream facilities. The major culverts and drainage channel sizes for the project have been estimated and are sized for the 100-year flow. These major drainage facilities are described below:

OS-2 to C1

There is currently an existing drainage channel along the east edge of Basin OS-2 running from north to south. The existing channel outlets through two culverts (1-36" dia. CMP and 1-24" dia HDPE) under the east-west grassed runway to an existing pond at the south end of Basin OS-2. This existing pond is proposed to be removed with the development of the site.

The current culverts are undersized to convey the 100-year storm event. A 10' wide by 4' high concrete box culvert (CBC) or equivalent will be needed to replace these existing culverts to convey the 10 and 100 year flows from off-site Basin OS-2 to Basin C-1. The culverts will discharge into a grass lined trapezoidal channel with a 5' bottom and 4:1 side slopes to convey flows toward Design Point 2. The flow within the channel in the 100-year storm will be approximately 3' deep.

DP-1 to DP-2
Currently this area flows from the small pond at Design Point 1 overland to the south into Basin Ex-5.

A proposed double 36" dia. RCP culvert will be needed to convey runoff from DP-1 under the taxiway to Basin C-1. The culvert will discharge into a grass lined swale and meet up with flows from OS-2 and will be conveyed to Design Point 2 within a grass lined trapezoidal channel with a 10' bottom and 4:1 side slopes. The flow within the channel will be approximately 4' deep during the 100-year storm.

DP-2 to DP-3 (Pond 2)
There are no existing culverts in this area. A proposed conduit system equivalent to 4-60" dia. RCP pipes for the 100 year storm will be needed to convey runoff from Design Point 2 to Pond 2.

DP-3 (Pond 2) to DP-4
Existing conveyance systems for this reach consist of an ephemeral stream running north to south.

A constructed channel will be needed to convey runoff from Pond-2 to Design Point 4. This trapezoidal channel will be a grass lined and approximately 10' bottom width with 4:1 side slopes and 4' deep during the 100-year event.

Basin D2 to DP-4
A double 36" diameter RCP culvert pipe will be required to convey the 100 year runoff under the proposed roadway to Design Point 4.

DP-4 to DP-6 (Pond 3)
The existing conveyance system for this reach consists of an ephemeral stream that runs generally north to south.

A 12'x5' concrete box culvert will be needed to convey the 100 year runoff under the proposed roadway. The proposed culvert will discharge into a proposed grass lined, trapezoidal channel (18' bottom width with 4:1 side slopes).

DP-5 to Basin D1b
A 8'x4' concrete box culvert or equivalent will be needed to convey the 100-year runoff under the taxiway connector without overtopping the taxiway. The culverts will discharge into a wide flat swale that runs north to south in between the proposed runway and the east taxiway.

Basin D1b to DP-6 (Pond 3)
A 16'x6' concrete box culvert will be needed to convey developed 100-year flows under the proposed roadway directly into Pond 3.

Pond 3 Discharge under Falcon Highway
Currently there is an existing steel bridge under Falcon Highway. The existing bridge consists of two sheet pile abutments with a steel beam and deck structure and asphalt road surface on top of the deck. Currently there is approximately 5.5 feet clear from bottom of the steel structure to the natural stream bed. This structure can adequately

pass the existing 100-year flow at an approximate depth of 4.6 feet. The existing structure (5.5' H x 24.0' W x 50.0' Long) can remain in use to convey detained flows from this project.

At the time when lane widening of Falcon Highway is required, this structure should be replaced with a proposed bridge/culvert of similar capacity.

DP-7 to Basin A2

A triple 30" diameter RCP culvert will be needed to convey runoff from Design Point 7 to Basin A2 under the proposed taxiway connectors. The proposed culverts will discharge into a shallow wide swale running from north to south between the proposed runway and west taxiway.

Pond 4 Discharge under Falcon Highway

Currently there is an existing 46" x 36" CMP arch culvert conveying flows under Falcon Highway at this location. This existing culvert cannot pass either the existing 10 or 100-year historic runoff without overtopping the roadway. The existing 100-year flow reaching the culvert is estimated to be 378.8 cfs. Currently the road bank acts as a detention pond. The existing culvert has a capacity of 69.1 cfs before the flow overtops Falcon Highway.

A proposed concrete box culvert of approximately 14' W x 4' H will be needed to convey the 100-year release from Pond 4 under Falcon Highway without overtopping the roadway. At the worst case, the outfall downstream of the site is at roughly 0.6% with approximately 30:1 side slopes. Using the developed 100-year flow of 299.0 cfs and a Manning's Coefficient of 0.40, the depth of flow adjacent to the houses is roughly 1.9' deep, which should be adequate to keep the adjacent houses out of the 100-year flow. It will be necessary to verify this once the final plans are prepared and more accurate topographic information is available.

7.0 DRAINGE BASIN FEES

Most of the project lies at the upper end of the Solberg Ranch Basin. To the west of the site is the Bennett Ranch Basin and to the East of the site is the Haegler Ranch Basin.

A small protion of land in the southwest corner of the site (Basin EX-14) lies in the Curtis Ranch Basin. As per the February 12, 2007 Basin Fee Schedule, there are no fees assigned to the Curtis Ranch Basin.

Two small areas (Basins Ex-2 and EX-7) lie within the Haegler Ranch Basin. The current fee structure for the Haegler Ranch Basin is as follows:

2007 Drainage Fee = $13,178.00
2007 Bridge Fee = $0.00

The remainder of the site lies within the Solberg Ranch Basin. The current fee structure for the Solberg Rand Basin is as follows:

2007 Drainage Fee = $13,178.00
2007 Bridge Fee = $0.00

All of the basins mentioned above are listed as "miscellaneous drainage basins" and have no drainage basin Planning study; however, the Haegler Ranch Basin is currently being studied at the time of this report.

Drainage Basin Fees for this development will be provided with the final drainage report at the then current fee rates.

8.0 REFERENCES

1. City of Colorado Springs and El Paso County (1994). *Drainage Criteria Manual Volume I* (DCM)

2. City of Colorado Springs and El Paso County (1994). *Drainage Criteria Manual Volume II* (DCM)

3. Soil Survey of El Paso County Area, Colorado by USDA, NRCS

4. El Paso County (January 2006) *Engineering Criteria Manual*

5. Urban Drainage and Flood Control District (June 2001). *Urban Storm Drainage Criteria Manual, Vol. 1-3*

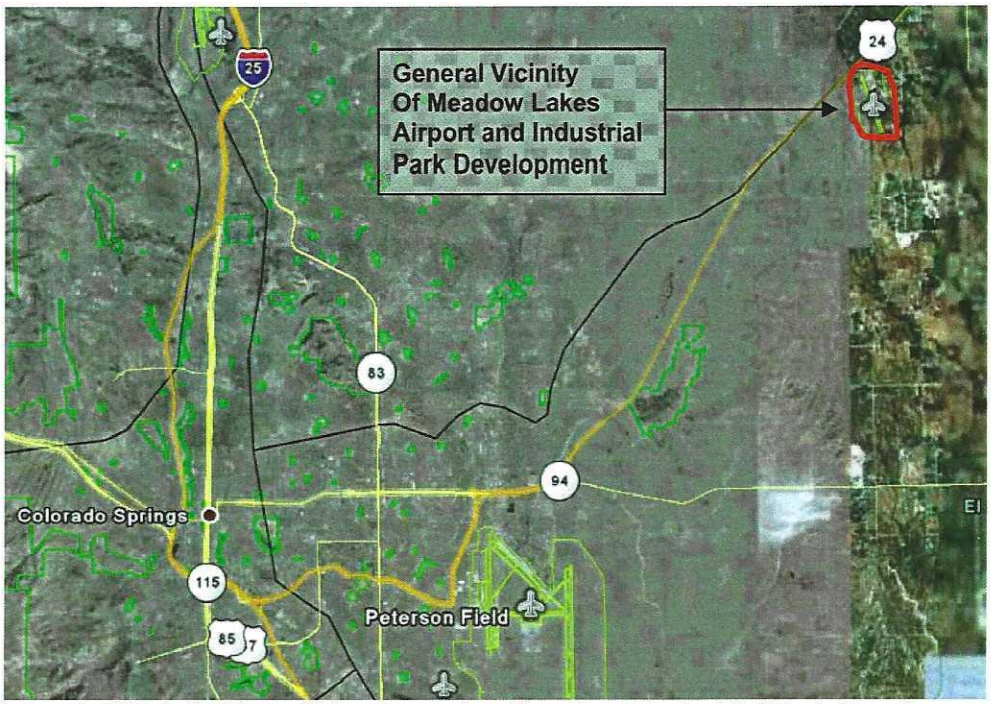


Figure A.1 Vicinity Map of Meadow Lake Airport and Industrial Park Development

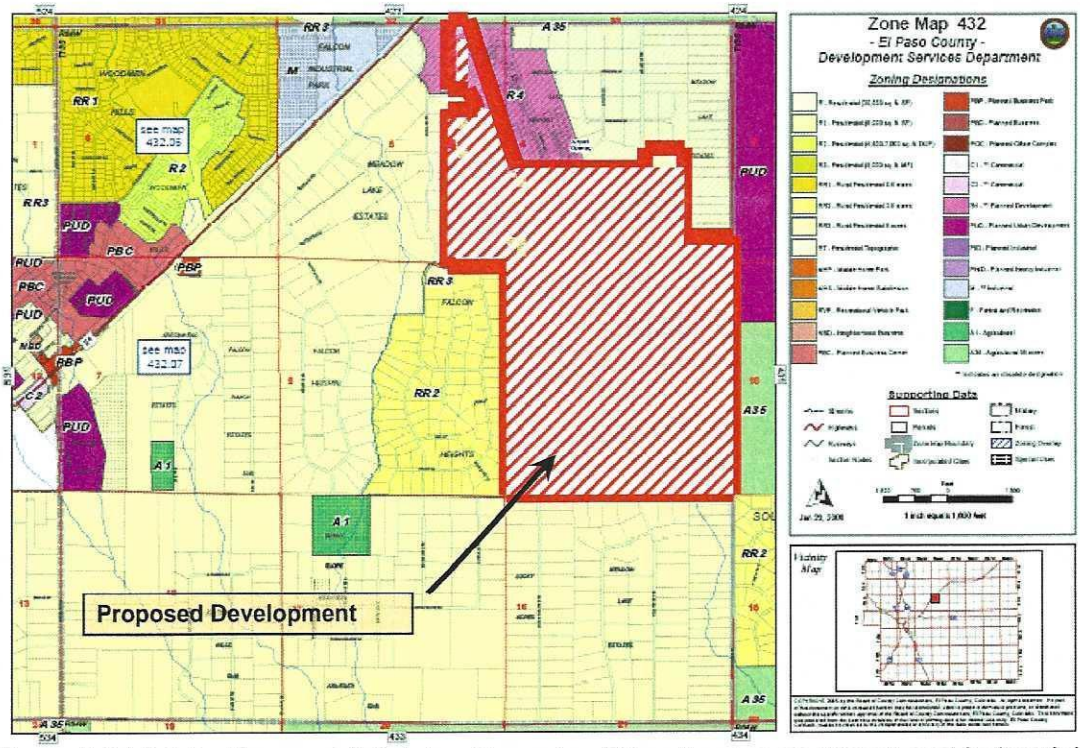
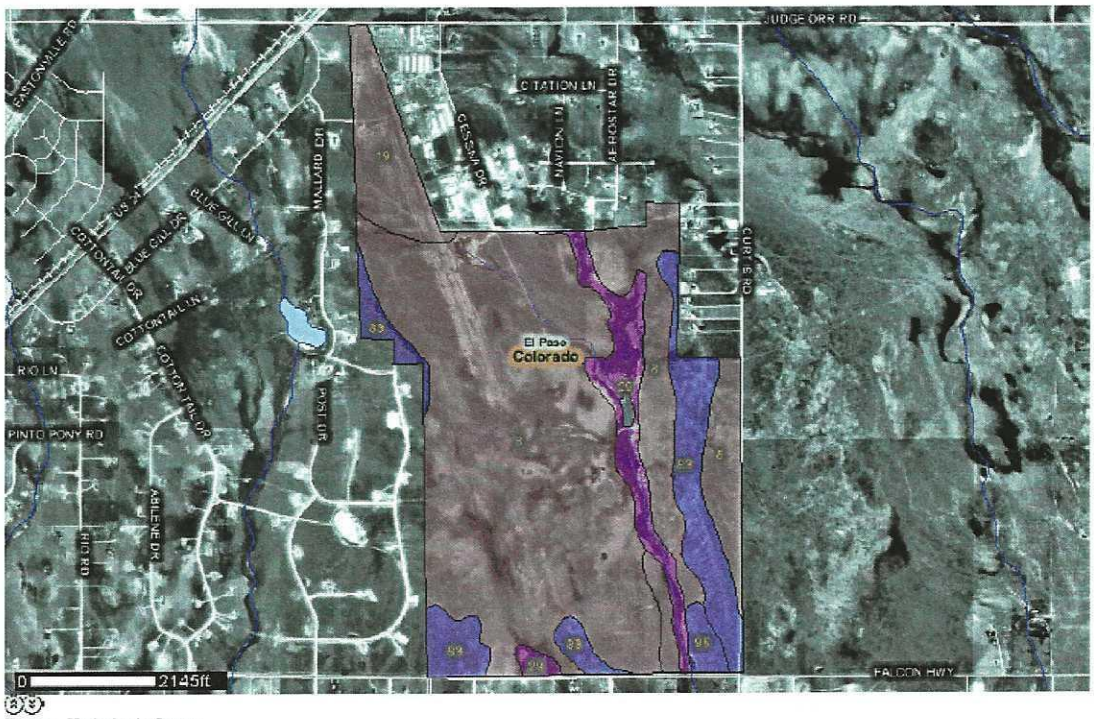


Figure A.2 Vicinity Map and Adjoining Property of Meadow Lakes Airport and Industrial Park Development

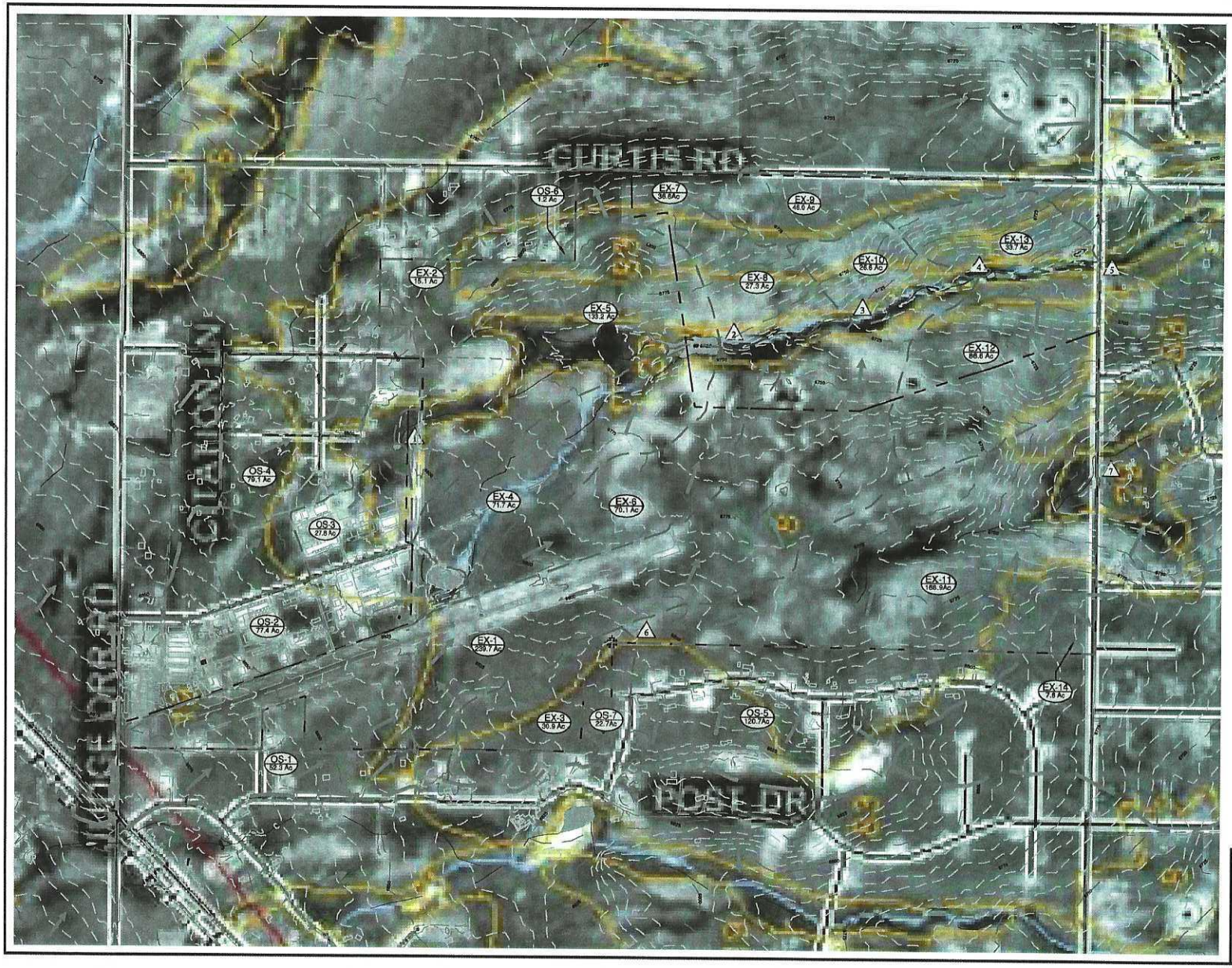
Web Soil Survey



Tables - Hydrologic Group

Summary by Map Unit - El Paso County Area, Colorado

Soil Survey Area Map Unit Symbol	Map Unit Name	Rating	Total Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	691.3	70.5
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	78.9	8.0
29	Fluvaquentic Haplaquolls, nearly level	D	71.5	7.3
83	Stapleton sandy loam, 3 to 8 percent slopes	B	124.1	12.6
95	Truckton loamy sand, 1 to 9 percent slopes	B	12.9	1.3
111	Water	Null	2.2	0.2



North

SCALE: 1"=1000'

SOILS MAP - LEGEND

PROPERTY LINE
MAJOR BASIN LINE
SUB-BASIN LINE
EX-2 15.1 Ac — BASIN ID / BASIN AREA

HYDROLOGIC SOILS GROUP	SOIL TYPE ID NUMBER
A	8 & 19
B	83 & 95
D	29

EXISTING CONDITIONS SOILS MAP

PENTACOR
12303 Airport Way, Suite 145
Broomfield, CO 80021
(303) 635-2303 FAX: (303) 635-2306

OCTOBER 2007

Physical Soil Properties

El Paso County Area, Colorado

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
8:														
Blakeland	0-11	—	—	3-9	1.55-1.65	42.00-141.00	0.06-0.09	0.0-2.9	2.0-4.0	.10	.10	5	2	134
	11-80	—	—	2-5	1.60-1.70	42.00-141.00	0.06-0.08	0.0-2.9	0.5-1.0	.20	.20			
Other soils	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pleasant	—	—	—	—	—	—	—	—	—	—	—	—	—	—
19:														
Columbine	0-14	—	—	3-8	1.35-1.60	42.00-141.00	0.07-0.09	0.0-2.9	1.0-2.0	.10	.17	2	3	86
	14-80	—	—	2-7	1.45-1.60	141.00	0.02-0.04	0.0-2.9	0.0-2.0	.05	.15			
Fluvaquentic Haplaquolls	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other soils	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pleasant	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29:														
Fluvaquentic Haplaquolls	0-12	—	—	—	—	1.41-42.33	—	—	1.0-3.0	—	—	3	8	0
	12-80	—	—	5-22	1.35-1.60	1.41-42.33	0.08-0.16	0.0-2.9	0.5-1.0	.20	.55			
Haplaquolls	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other soils	—	—	—	—	—	—	—	—	—	—	—	—	—	—