DRAINAGE REPORT
FOR
MESA DEL SOL
RESIDENTIAL
MONTAGE UNIT I AND 2

JANUARY 14, 2011

PREPARED FOR:
MESA DEL SOL
801 UNIVERSITY BLVD SE - SUITE 200
ALBUQUERQUE, NM 87106

PREPARED BY:
BOHANNAN HUSTON, INC.
COURTYARD I
7500 JEFFERSON STREET NE
ALBUQUERQUE, NM 87109

Prepared By:

1/13/11
Brian C. Patterson, P.E. Date
Design Engineer

1-13-11
Christian J. Sholtis, P.E. Date
Project Manager

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I. PURPOSE

This drainage report is for Mesa del Sol Residential Montage Unit 1 and 2. The proposed development consists of approximately 231 single family detached and attached residential lots on approximately 40 acres which will be developed in two units (Unit 1 and 2). This project is located within Mesa del Sol, in southeast Albuquerque south of the intersection of Bobby Foster Road and University Blvd. The Mesa del Sol Residential Montage Unit 1 and 2 is part of a larger phase of residential development which will occur in the future; however, the fully developed drainage for the ultimate future condition as well as the interim developed conditions are addressed by this report. This report is submitted in support of grading approval and preliminary plat approval by the DRB.

II. CONCEPTS AND METHODOLOGIES

Drainage conditions were analyzed utilizing the 100-year, 6-hour storm event in accordance with the City of Albuquerque DPM. The Arid-lands Hydrologic Model (AHYMO) was utilized to determine peak flow rates for design of the storm drainage improvements within the project. The results are included in Appendices A through C. Street capacity and storm drain inlet calculations supporting this study are located in Appendix B.

The overall drainage concept for this project will be onsite and offsite ponding of storm water in the future ultimate developed conditions. Onsite runoff will be captured by a system of interconnected storm ponding areas, which are designed to retain and infiltrate approximately the 2-year storm volume, but detain and release the remaining portion of the 100-year storm volume. These ponds will act to improve the quality of the storm water leaving each pond by removing sediment and debris from the flows entering the ponds. In the interim developed conditions, these ponds will function as retention ponds as a temporary condition until the project is built out and these are designed to retain the 100-year 10-day storm volume. These ponds will be owned and maintained by Mesa del Sol with agreement and covenants with the City of Albuquerque. In Albuquerque, approximately 90% of the annual runoff is generated by rainfall events that are 1 inch or less, which equates to approximately the 2-year storm; therefore, this was the basis for determining the volume of storm water to be retained by the ponds for infiltration. The infiltration time for draining each of the permanent ponds, in the future ultimate conditions will be 96 hours or less. The ponds will bleed off the upper detention pond volume in 8 hours or less via a proposed underground storm drain pipe to the existing playa located south and east of this project, where historically the runoff from this project and surrounding areas has been directed to, and will continue to be retained. Although, it appears at this time that there is more than adequate storage capacity within the existing playa to accept all future developed runoff from the entire Mesa del Sol project, the playa can be widened and deepened in the future if additional capacity is needed at the time full build out occurs. Offsite flows affecting this project from the west will be captured by temporary retention ponds until development to the west occurs.

The following document was referenced in the preparation of this report:

- *Technical Appendices for the Level B Plan for Mesa del Sol*, prepared by Calthorpe Associates, dated October 2006.

The Level B Plan contains a conceptual Drainage Management Plan (DMP), which outlines both existing and developed drainage conditions. Retention ponding of the 10-day developed storm volume is proposed by this report both by proposed ponding areas as well as the existing playa area located to the south within Zone 'A' as designated by FEMA, which has historically captured and retained storm water from the Mesa del Sol area. In addition, the Level B DMP states a volume capacity of the existing playa of 2,300 ac-ft, which is far in excess of the developed runoff volume of 480 ac-ft for the entire Mesa del Sol development; therefore, the DMP demonstrates adequate downstream capacity. The Level B DMP also allows for a modified approach for regional ponding area, which consists of infiltrating the volumes smaller than the 10-day storm volume and bleeding off the remaining volume through a storm drain pipe, which will ultimately discharge into the existing playa. Therefore, the proposed concept for this report is in conformance with the Level B DMP.

III. SITE LOCATION AND CHARACTERISTICS

Mesa del Sol Residential Montage Unit 1 and 2 will be developed in two units, Unit 1 and 2. Unit 1 will consist of the southerly portion of the project and the unit 2 will comprise the remaining north half. Access to both units will be from University Blvd. SE.

The site is relatively flat and generally slopes from west to east at an average grade of about 0.5%.

IV. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

The land comprising Mesa del Sol Residential Montage Unit 1 and 2 is currently undeveloped. The northbound lane of University Blvd. located north and east of the site has been constructed and the Albuquerque Studios are located north and east of the existing roadway. Runoff generated by the project site in its present state sheet flows southeast which is then intercepted and retained by an existing closed-basin playa located southeast of the site. The existing playa represents the historic runoff capture point for the project site as well as the surrounding areas, and again, this flow has been historically retained and infiltrated within the existing playa.

V. INTERIM DEVELOPED HYDRAULIC AND HYDROLOGIC CONDITIONS

A. Retention Ponds

Ponds 2A, 2B, and 3 act as retaining ponds during the interim developed conditions. In addition, Ponds 2B and 3 act as a single retention pond due to a connector pipe between the two ponds. No infiltration is accounted for in these ponds during this scenario.

B. Offsite Flows

Undeveloped offsite flows from Basin S as shown on the Developed Conditions Basin Map located west of the project impact the site. Runoff from Basin S will be captured by Pond 2A located

within Basin H (please refer to the Developed Conditions Basin Map). Basins K and Q have previously been graded; therefore land treatment C was used for the analysis of these basins. Basin K in its current graded configuration retains all undeveloped flows onsite within the existing sump area Basin Q will discharge south and be collected by Pond 4 (please see below referring to Pond 4 details).

C. Onsite Flows

Basins A, B, C-1, D, E, F and G will discharge runoff into proposed ponds 2A, 2B, and 3, which will be located in a proposed park/commons area. All developed runoff will be directed into these ponds utilizing the proposed street network combined with a proposed underground storm drain system (please see Developed Conditions Basin Map for basin locations, and Exhibit 8 for storm drain and inlet locations).

In the Interim developed conditions, a temporary dirt berm will be graded on the uphill side of Avedon Dr., upstream of Unit 1 / Unit 2 divide. The berm is in place to divert any Unit 2 storm water from entering Unit 1 before the Unit 2 infrastructure is built. The berm will divert the storm water to a low point where it will retained within the graded area and a temporary retention pond (please see Unit 1 Grading Plan for more details). The retention pond and berm will be removed when the Unit 2 infrastructure is built.

VI. FUTURE DEVELOPED HYDRAULIC AND HYDROLOGIC CONDITIONS

A. Permanent Storm Water Detention Ponds

Proposed Ponds1, 2A, 2B and 3 will be interconnected by proposed storm drain pipes and will be located within proposed parks and common areas. During the future developed conditions, these ponds as well as future Pond 1, are designed to retain approximately the 2-year storm volume and detain and release the remaining portion of the 100-year 6-hour volume. Runoff in excess of the 2-year volume will drain from these ponds with the 100-year 6-hour storm draining from the ponds in 10 hours or less while the 2-year volume will be retained and infiltrated as per the concept discussed in the previously referenced Level B Plan for the project. These ponds will ultimately outfall via a proposed storm drain pipe to Pond 4, a proposed interim retention/detention pond with an overflow that will discharge to the existing closed basin playa located to the south in the future. Pond 4 will be upgraded and improved by future projects as these projects develop.

The permanent storm ponds (Ponds 1-3) will each consist of a forebay, primary storage zone, infiltration basin, and pond outlet (please see Exhibit 9). The forebay will be located at the pipe inlet into the pond and its purpose is to dissipate energy and deposit sediment from the storm water. The infiltration basin consisting of a bed of gravel and/or rip-rap will assist in infiltrating the 2-year storm volume, and in concert with infiltration occurring in the remaining earthen portions of the pond, has been

designed to drain the 2-year storm water volume in 96 hours or less. The infiltration basins will be located a sufficient distance from the forebays in order to minimize the amount of silt entering the infiltration basins. The pond outlet pipe will drain the storm water volume in excess of the 2-year volume and will be designed in conjunction with the pond storage volume to accommodate the 100-year 6-hour storm water volume and peak flowrate.

Infiltration calculations were based on an average of percolation test results performed by Geo-Test, Inc. on a permanent pond immediately north of Albuquerque Studios Mesa del Sol, New Mexico dated May 17, 2007 File No. 1-61211. A percolation rate of 0.3 in/hr was recorded for 24" above ground surface, which was neglected for our average in our infiltration calculations. This was based on the assumption that the ponds would be cleaned and maintained before the point of virtually no infiltration was reached. A factor of safety of 1.1 was then used for the infiltration basin and a factor of safety of 2.0 was used for the remaining area of the pond to determine the time to infiltrate the required storm water volume, which is approximately the 2-year storm water volume in **Equation 1**.

Equation 1. $T_{Drian}=Vol_{req}/((i\ pond(A_{eff}))+(i\ infiltration\ basin\ (A_{eff})))$

Where: Vol_{req}= Storm Volume (cf)

i_{pond} = Pond Infiltration rate = i/2.0 (in/hr)

i infiltration basin= Infiltration basin rate= i/1.1 (in/hr)

Infiltration basin = Area Infiltration Basin (sf)

A_{eff} = Avg Pond Area Minus Infiltration basin (sf)

B. Additional Basins

Basins T, U, V and W as shown on the Future Conditions Basin Map will discharge into Pond 1. Basin J, X, Bobby Foster and a portion of Basin Y will discharge into Pond 2A. The remaining portion of Basin Y will discharge into Pond 2B. Basin K will discharge into Pond 3. Basins Q and R will discharge into the Pond 4 system. Basin L will discharge onto Stryker Road SE and flow into the proposed storm drain system leading to Pond 4. Basins N, M, O and P within which the future town center will be located will have free discharge into the proposed storm drain within University Blvd. The proposed pond system as well as the storm drain system has been designed to accommodate the future developed condition of this project (please refer to the Future Conditions Basin Map for basin locations). The existing playa will accept runoff leaving the site under the future developed conditions scenario in conformance with the Level B Drainage Management Plan.

VII. CONCLUSION

The drainage concept outlined by this report consists of largely detention/retention ponding of developed runoff. Under the development proposed by this project for Units 1 and 2, Ponds 2A, 2B and 3 will function as

temporary retention ponds until such time that adjacent future development occurs. These ponds will then be converted to detention ponds by installing additional storm drain connections pipes. The proposed permanent storm pond system will discharge via an underground storm drain toward the southeast to a proposed interim storm drain outlet/retention pond, which overflows to the existing playa. Ponds 1-4 have been designed for the future fully developed condition. These flows can be safely conveyed by the improvements proposed in this drainage plan to proposed drainage facilities, which have adequate capacity to accept such runoff. The proposed drainage concept is in conformance with the Level B Drainage Management Plan. Erosion and dust control, consisting of erosion control berms, silt fencing and sedimentation basins, are proposed to mitigate soil washing or blowing into paved streets, storm drains, and existing developed areas. This drainage plan maintains the overall drainage pattern of the area and allows for the safe management of storm runoff in the fully developed condition as well as interim conditions.