DRAINAGE CALCULATIONS

DRAINAGE PLAN

THE FOLLOWING ITEMS CONCERN A PROPOSED 216 MULTI-FAMILY RESIDENTIAL COMPLEX KNOWN AS SOTOGRANDE HOUSING WHICH IS LOCATED AT THE NORTHEAST CORNER OF WOODWARD ROAD SE AND FLIGHTWAY AVENUE SE. ALBUQUERQUE, NEW MEXICO. THE FOLLOWING GRADING AND DRAINAGE PLAN INFORMATION IS CONTAINED HEREON:

1. DRAINAGE CALCULATIONS
2. DRAINAGE BASIN MAP
3. DRAINAGE GRADING PLAN
4. VICINITY MAP (M-15)
5. FLOOD INSURANCE RATE MAP 35001C0342G - SEPT 26, 2008

EXISTING CONDITIONS

AS SHOWN BY THE VICINITY MAP, THE SITE IS BOUNDED ON THE SOUTH BY WOODWARD ROAD SE ON THE WEST BY TRANSPORT STREET SE AND THE NORTH BY FLIGHTWAY AVENUE SE AND THE EAST BY LOT 2-A-2, BLOCK 2 SUNPORT PARK (SEE ATTACHED VICINITY MAP M-15). THE PARCEL'S LEGAL DESCRIPTION IS LOT 1-A AND LOT 2-A-1, BLOCK 2, SUNPORT PARK, ALBUQUERQUE, NEW MEXICO FILED IN THE OFFICE OF THE COUNTY CLERK OF BERNALILLO COUNTY, NEW MEXICO ON AUGUST 21, 1990 IN MAP BOOK 90C, FOLIO 195. LOT 1A CONTAINS APPROXIMATELY 10.1 ACRES AND LOT 2A1 CONTAINS APPROXIMATELY 0.59 ACRES. AS PART OF THIS DEVELOPMENT LOT 1A AND LOT 2A1 WILL BE REPLATTED AND COMBINED FOR A TOTAL ACREAGE OF 10.69ACRES.

PER RECENT SITE VISITS DONE AS PART OF PREPARING THIS DRAINAGE PLAN THE EXISTING SITE IS UNDEVELOPED WITH NATIVE GRASSES AND MINIMAL DISTURBANCE BY OVERHEAD UTILITIES. THE AREA IS RELATIVELY STEEP WITH SLOPES FROM 6% TO 10% IN AN EAST TO WEST DIRECTION.

THIS SITE LIES WITH A MASTER DRAINAGE PLAN KNOWS AS SUNPORT PARK - PHASE 1, DATED 1996. IN PARTICULAR THE MAJORITY OF THE SITE LIES WITH DRAINAGE BASINS A-4, A-5 AND A-9, AND A SMALL PORTION WITHIN DRAINAGE BASIN A-2. A STORMDRAIN SYSTEM WAS CONSTRUCTED ALONG THE WEST BOUNDARY OF THIS SITE ON TRANSPORT STREET SE THAT ACCEPTS THE FLOW FROM THIS SITE ALONG WITH OTHER ADJACENT AREAS THAT DRAIN INTO FLIGHTWAY AVENUE SE AND WOODWARD ROAD SE. DRAINAGE BASINS A-2, A-4 AND A-5 ALLOWS A DISCHARGE RATE OF 3.4CFS/ACRE AND DRAINAGE BASIN A-9 ALLOWS A DISCHARGE RATE OF 3.85CFS/ACRE.

PROPOSED CONDITIONS

THE PROPOSAL FOR REPLATTING OF THIS SITE CONSIST OF VACATING THE LOT LINE BETWEEN LOT 1-A AND LOT 2-A-1 IN ORDER TO CREATE ONE LEGAL TRACT FOR THIS MULTI-FAMILY RESIDENTIAL COMPLEX.

AS SHOWN BY THE PLAN, THE PROJECT CONSISTS OF NINE MAIN BUILDINGS CONTAINING THE MULTI-FAMILY UNITS AND ONE MAIN BUILDING CONTAINING THE COMMUNITY BUILDING AND SWIMMING POOL. DUE TO THE RELATIVELY STEEP 6% TO 10% EAST TO WEST SLOPES THE SITE WILL BE GRADED TO CREATE A RELATIVELY FLAT TERRACE SLOPE ALONG THE CENTER OF THE PROPERTY FOR THE COMPLEX BY USING STEPPED RETAINING WALLS THAT VARY IN OVERALL HEIGHT FROM 12' TO 17' ALONG THE EAST AND WEST SIDES OF THIS DEVELOPMENT.

INTERNAL PAVED VEHICULAR CIRCULATION AND PARKING WILL BE PROVIDED FOR THE DEVELOPMENT TO SERVE THE MULTI-FAMILY COMPLEX. DRAINAGE FROM THE UNITS WILL BE DISCHARGED INTO THE INTERNAL CIRCULATION AND DISCHARGED TO TWO NEW DRAINAGE PONDING AREAS, ONE AT THE NORTHWEST CORNER OF THE SITE AND THE OTHER AT THE SOUTHWEST CORNER OF THE SITE. EACH POND WILL BE RECEIVING ABOUT 50% OF THE SITE DRAINAGE. THE INTENT OF EACH OF THE NEW DRAINAGE PONDS IS TO CAPTURE THE FIRST FLUSH REQUIREMENTS WHICH IS THE 90TH PERCENTILE STORM EVENT (FIRST 0.44 INCHES) ALONG WITH ADDITIONAL FLOW NECESSARY TO REDUCE THE PEAK FLOW DISCHARGE AS PER THE MASTER DRAINAGE PLAN. THE ALLOWABLE PEAK FLOW FROM THIS DEVELOPMENT WILL THEN BE DISCHARGED INTO THE EXISTING STORM DRAIN SYSTEM IN FLIGHTWAY AVENUE SE.

THE CALCULATIONS WHICH APPEAR HEREON, ANALYZE BOTH THE EXISTING AND DEVELOPED CONDITIONS FOR THE 100-YEAR, 6-HOUR RAINFALL RUNOFF FOR PEAK FLOWS AND STORM DETENTION FOR VOLUME REQUIREMENTS. THE PROCEDURE FOR 40 ACRE AND SMALLER BASINS AS SET FORTH IN THE REVISION OF SECTION 22.7 HYDROLOGY OF THE DEVELOPMENT PROCESS MANUAL, VOLUME 2, DESIGN CRITERIA, DATED JANUARY 1993. THIS D.P.M. PROCEDURE IS USED FOR ANALYZING ONSITE FLOWS.

DOWNSTREAM CAPACITY

BASED ON THE MASTER DRAINAGE PLAN KNOWS AS SUNPORT PARK - PHASE 1, DATED 1996, THIS DEVELOPMENT WILL FOLLOW THE LIMITED DISCHARGE RATES ALLOWED BY THIS MASTER PLAN BY THE USE OF TWO DRAINAGE PONDS TO REDUCE THE ALLOWABLE DISCHARGE RATE FROM THIS SITE.

OFFSITE FLOWS

BASED ON THE TOPOGRAPHIC SURVEY IT APPEARS LOT 2-A, BLOCK 2, WHICH IS EAST OF THIS DEVELOPMENT AS HAD SOME GRADING DISTURBANCE TO TRY AND FORCE HALF THE SITE TO THE SOUTH INTO WOODWARD ROAD SE AND THE OTHER HALF NORTH WHICH ULTIMATELY COMES ONTO THIS DEVELOPMENT. THE FIRST +/-30 FEET EAST OF THIS DEVELOPMENT SHEET FLOWS ONTO THIS DEVELOPMENT.

A PROPOSED DRAINAGE PLAN (M-15/D23G) WAS SUBMITTED TO HYDROLOGY IN APRIL 2016 WHICH PROPOSED TO DRAIN THE SOUTH HALF ONTO WOODWARD ROAD SE AND THE NORTH HALF INTO A NEW RETENTION POND AT THE NORTH END OF LOT 2-A WITH A SPILLWAY SIZED TO DRAIN THIS POND AT A RELEASE RATE OF 1.6CFS. THIS DEVELOPMENT WILL SIZE INFRASTRUCTURE TO ACCEPT THIS OFFSITE FLOW BASED ON A FLOW RATE OF 6.1CFS WHICH IS BASED ON THE DEVELOPED CONDITIONS IN CASE THIS PROPOSED POND SHOULD FAIL IN THE FUTURE.

IN THE INTERIM UNTIL THIS OFFSITE DEVELOPMENT (M-15/D23G) IS DEVELOPED THIS MULTI-FAMILY WILL CONSTRUCT A SWALE ABOVE THE EAST RETAINING WALL TO DISCHARGE THE SOUTH HALF ONTO WOODWARD ROAD SE AND DRAIN THE NORTH HALF NORTH INTO INFRASTRUCTURE THAT CAN ACCEPT THIS OFFSITE FLOW TO MINIMIZE DISTURBANCE TO THIS DEVELOPMENT.

EROSION CONTROL

THE CONTRACTOR WILL BE REQUIRED TO PREPARE A STORM WATER POLLUTION PREVENTION PLAN FOR THE SITE PRIOR TO ROUGH GRADING OF THE SITE. THE CONTRACTOR WILL ALSO BE REQUIRED TO SECURE A TOP SOIL DISTURBANCE PERMIT ALONG WITH A STORM WATER POLLUTION PREVENTION PLAN FROM THE EPA PRIOR TO ROUGH GRADING OF THE SITE.

THE CONTRACTOR WILL ALSO BE REQUIRED TO PROTECT EXISTING INLETS ALONG FLIGHTWAY AVENUE SE ADJACENT TO THE SITE WITH SEDIMENT CONTROL MEASURES DURING CONSTRUCTION IN ORDER TO MINIMIZE SEDIMENT FROM ENTERING THESE INLETS AND ADJACENT STREETS.

DRAINAGE CALCULATIONS:

1. PRECIPITATION ZONE = 2

2. DESIGN STORM = DEPTH (INCHES) AT 100-YEAR STORM
   6-HOUR = 2.35 INCHES
   24-HOUR = 2.75 INCHES
   10 DAY = 3.95 INCHES

3. PEAK DISCHARGE (CFS/ACRE) FOR 100-YEAR, ZONE 2, TABLE A-9:
   Q = 1.56 CFS/ACRE SOIL UNCOMPACTED "A"
   Q = 2.28 CFS/ACRE LANDSCAPED "B"
   Q = 3.14 CFS/AC COMPACTED SOIL "C"
   Q = 4.70 CFS/AC IMPERVIOUS AREA "D"
   FOR WATERSHEDS LESS THAN OR EQUAL TO 40 ACRES

4. EXCESS PRECIPITATION, E (INCHES), FOR 100-YEAR, 6 HOUR STORM, ZONE 2, TABLE A-8:
   E = 0.53 INCHES SOIL UNCOMPACTED "A"
   E = 0.78 INCHES LANDSCAPED "B"
   E = 1.13 INCHES COMPACTED SOIL "C"
   E = 2.12 INCHES IMPERVIOUS AREA "D"

5. EXISTING CONDITIONS ONSITE FLOWS (LOT 1-A AND LOT 2-A-1)
   TOTAL AREA = 10.69ACRES
   IMPERVIOUS AREA "A" = 10.69ACRES
   Q(EXISTING-6HR) = [1.56 X 10.69] = 16.68CFS (6HR) EXISTING 100-YEAR ONSITE FLOW RATE INTO EXISTING STORM DRAINS ADJACENT TO THE SITE ON FLIGHTWAY AVENUE SE
   V(PROPOSED-6HR) = [(0.53 X 10.69)/ 12] = 0.47AC-FT = 20.556CF EXISTING 100-YEAR ONSITE FLOW VOLUME INTO EXISTING STORM DRAINS ADJACENT TO THE SITE ON FLIGHTWAY AVENUE SE

6. PROPOSED CONDITIONS ONSITE FLOWS INTO SOUTHWEST DRAINAGE POND DRAINAGE BASIN "ONSITE-1"
   TOTAL AREA = 169,897SF = 3.90ACRES
   ROOF AREA, TYPE "D" = 8,350SF(A) + 10,160SF(D) + 5,550SF(COMM) = 33,260SF = 0.76ACRES
   ASPHALT ACCESS, PARKING AND SIDEWALKS, TYPE "D" = 61,072SF = 1.40AC
   TYPE B AND C, 50% EACH OF REMAINING AREAR = 0.50 (3.90AC - 0.76AC - 1.40AC) = 0.87AC/EACH

   TREATMENT B AND C

TREATMENT	AREA(ACRES)
A	0
B	0.87
C	0.87
D	2.16

   Q(PROPOSED-6HR) = (2.28 X 0.87) + (3.14 X 0.87) + (4.70 X 2.16) = 14.87CFS (6HR) PROPOSED 100-YEAR ONSITE FLOW VOLUME INTO SOUTHWEST DRAINAGE POND
   V(PROPOSED-6HR) = [(0.78 X 0.87) + (1.13 X 0.87) + (2.12 X 2.16)]/ 12] = 0.52AC-FT = 22,651CF PROPOSED 100 YEAR ONSITE VOLUME INTO SOUTHWEST DRAINAGE POND

7. ALLOWABLE RELEASE RATE BASED ON SOUTHWEST POND PER SUNPORT PARK MASTER PLAN FOR DRAINAGE BASIN "ONSITE-1"
   TOTAL AREA = 169,897SF = 3.90ACRES
   PERCENT OF BASIN "ONSITE-1" AREA WITHIN MASTER DRAINAGE BASINS "A-9" AND "A-5"
   PERCENT = [115,584SF / 169,897SF] X 100% = 68% BASIN "A-9"
   PERCENT = [54,293SF / 169,897SF] X 100% = 32% BASIN "A-5"
   ALLOWABLE DISCHARGE RATE FOR "ONSITE-1" = (0.68 X 3.90AC X 3.85CFS/AC) + (0.32 X 3.90AC X 3.4CFS/AC) = 14.45CFS ALLOWABLE

   Q(PROPOSED-6HR) FOR BASIN "ONSITE-1" = 14.87CFS > 14.45CFS ALLOWABLE DISCHARGE RATE, **REDUCE BASIN "ONSITE-1" BY 0.42CFS TO MINIMIZE DOWNSTREAM CAPACITY IMPACTS**

8. PROPOSED CONDITIONS INTO SOUTHWEST DRAINAGE POND PER FIRST FLUSH STORM WATER CONTROL MEASURES PER ORDINANCE O-2013016 FOR DRAINAGE BASIN "ONSITE-1"
   FOR THE PURPOSED OF THE ORDINANCE THE 90TH PERCENTILE STORM EVENT IS 0.44INCHES FROM IMPERVIOUS ARES.
   V(FIRST FLUSH) = 0.44" X TREATMENT "D" = (0.44"/12"/") X 94,089SF = 3,450CF REQUIRED TO BE DETAINED FOR FIRST FLUSH

9. PROPOSED SOUTHWEST DRAINAGE POND VOLUME
   ELEVATION = 5074.0   AREA = 2,430SF
   ELEVATION = 5077.0   AREA = 4,752SF
   VOLUME PROVIDE = [(2,430SF & 4,752SF)/2] X 3FEET DEPTH = 10,773CF

10. HYDROGRAPH FOR SOUTHWEST POND
   Td(BASE TIME) = (2.017 X E X At/Qp) - (0.25 x Ad/At)
   E = (0.87 x 0.78) + (0.87 x 1.13) + (2.16 x 2.12)]/ 3.90 = 1.60inches
   Td(BASE TIME) = [(2.017 x 1.60 x 3.90)/14.87) - (0.25 x 2.16/3.90) = 0.71hour
   Tp(PEAK) = [0.7 X Tc] + [(1.6 - (Ad/At)]/12)
   Tp(PEAK) = [0.7 x 0.2hr] + [(1.6 - (2.16/3.90)] / 12 = 0.23hours
   T = 0.25 X Ad/At = 0.25 X (2.16/3.90) = 0.14hours

11. VOLUME REQUIRED PER HYDROGRAPH TO BE DETAINED BASED ON ALLOWABLE RELEASE RATE FOR SOUTHWEST POND
   VOL(RELEASE RATE) = (14.87CFS - 14.45CFS) X 0.14hours x 3600sec/hour
   VOL(RELEASE RATE) = 236CF, USE 1,000CF
   VOL(REQUIRED) = 3,450CF(FIRST FLUSH) + 1,000CF(ALLOWABLE) = **4,450CF REQUIRED < 10,773CF REQUIRED OK**

12. PROPOSED CONDITIONS ONSITE FLOWS INTO NORTHWEST DRAINAGE POND FOR DRAINAGE BASIN "ONSITE-2"
   TOTAL AREA = 256,576SF = 5.89ACRES
   ROOF AREA, TYPE "D" = 9,200SF(C) + 10,160SF(D) + 8,350SF(A) + 9,200SF(C) + 9,040SF(B) + 8,350SF(A) = 54,300SF = 1.25ACRES
   ASPHALT ACCESS, PARKING AND SIDEWALKS, TYPE "D" = 99,248SF = 2.27AC
   TYPE B AND C, 50% EACH OF REMAINING AREAR = 0.50 (5.89AC - 1.25AC - 2.27AC) = 1.18AC/EACH REMAINING B AND C
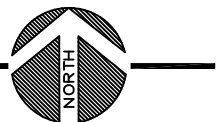
TREATMENT	AREA(ACRES)
A	0
B	1.18
C	1.19
D	3.52

   Q(PROPOSED-6HR) = (2.28 X 1.18) + (3.14 X 1.19) + (4.70 X 3.52) = 22.97CFS (6HR) PROPOSED 100-YEAR ONSITE FLOW VOLUME INTO NORTHWEST DRAINAGE POND
   V(PROPOSED-6HR) = [(0.78 X 1.18) + (1.13 X 1.19) + (2.12 X 3.52)]/ 12) = 0.81AC-FT = 35,284CF PROPOSED 100 YEAR ONSITE VOLUME INTO NORTHWEST DRAINAGE POND

13. ALLOWABLE RELEASE RATE BASED FOR NORTHWEST DRAINAGE POND PER SUNPORT PARK MASTER PLAN FOR DRAINAGE BASIN "ONSITE-2"
   TOTAL AREA = 256,576SF = 5.89ACRES
   PERCENT OF BASIN "ONSITE-2" AREA WITHIN MASTER DRAINAGE PLAN BASINS "A-5", "A-4" AND "A-2"
   PERCENT = [85,280SF / 256,576SF] X 100% = 33% BASIN "A-5"
   PERCENT = [146,128SF / 256,576SF] X 100% = 57% BASIN "A-4"
   PERCENT = [25,104SF / 256,576SF] X 100% = 10% BASIN "A-2"
   ALLOWABLE DISCHARGE RATE FOR "ONSITE-2" = (0.33 X 5.89AC X 3.4CFS/AC) + (0.57 X 5.89AC X 3.4CFS/AC) + (0.10 X 5.89A X 3.4CFS/AC) = 20.02CFS ALLOWABLE

   Q(PROPOSED-6HR) FOR BASIN "ONSITE-2" = 22.97CFS > 20.02CFS ALLOWABLE DISCHARGE RATE, **REDUCE BASIN "ONSITE-2" BY 2.95CFS TO MINIMIZE DOWNSTREAM CAPACITY IMPACTS**

13. PROPOSED CONDITIONS INTO SOUTHWEST DRAINAGE POND PER FIRST FLUSH STORM WATER CONTROL MEASURES PER ORDINANCE O-2013016 FOR DRAINAGE BASIN "ONSITE-2"
   FOR THE PURPOSED OF THE ORDINANCE THE 90TH PERCENTILE STORM EVENT IS 0.44INCHES FROM IMPERVIOUS ARES.
   V(FIRST FLUSH) = 0.44" X TREATMENT "D" = (0.44"/12"/") X 153,334SF = 5,622CF REQUIRED TO BE DETAINED FOR FIRST FLUSH

15. PROPOSED NORTHWEST DRAINAGE POND VOLUME
   ELEVATION = 5072.5   AREA = 5,094SF
   ELEVATION = 5074.0   AREA = 8,505SF
   VOLUME PROVIDE = [(5,094SF + 8,505SF)/2] X 1.5FEET DEPTH = 10,199CF

16. HYDROGRAPH FOR NORTHWEST POND
   Td(BASE TIME) = (2.017 X E X At/Qp) - (0.25 x Ad/At)
   E = [(1.18 x 0.78) + (1.19 x 1.13) + (3.52 x 2.12)]/ 5.89 = 1.65inches
   Td(BASE TIME) = [(2.017 x 1.65 x 5.89)/22.97) - (0.25 x 3.52/5.89) = 0.70hour
   Tp(PEAK) = [0.7 X Tc] + [(1.6 - (Ad/At)]/12)
   Tp(PEAK) = [(0.7 x 0.2hr) + [(1.6 - (3.52/5.89)] / 12 = 0.22hours
   T = 0.25 X Ad/At = 0.25 X (3.52/5.89) = 0.15hours

17. VOLUME REQUIRED PER HYDROGRAPH TO BE DETAINED BASED ON ALLOWABLE RELEASE RATE FOR SOUTHWEST POND
   VOL(RELEASE RATE) = (22.97CFS - 20.02CFS) X 0.15hours x 3600sec/hour
   VOL(RELEASE RATE) = 1,593CF, USE 2,000CF
   VOL(REQUIRED) = 5,622CF(FIRST FLUSH) + 2,000CF(ALLOWABLE) = **7,622CF REQUIRED < 10,199CF REQUIRED OK**
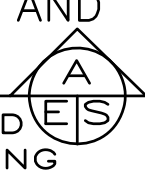

DRAINAGE BASIN BOUNDARY MAP

SCALE: 1" = 100'

erstad ARCHITECTS, PA

VICINITY MAP M-15-Z

FIRM MAP 35001C8342G

12-05-2016

SOTOGRANDE HOUSING
2900 Transport Street SE
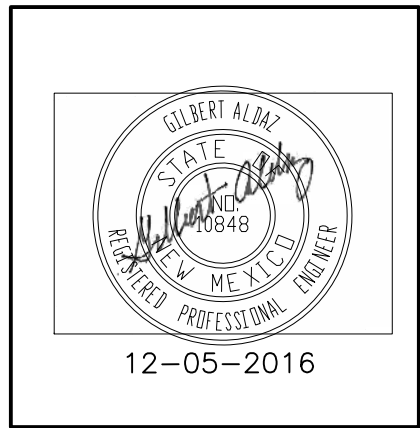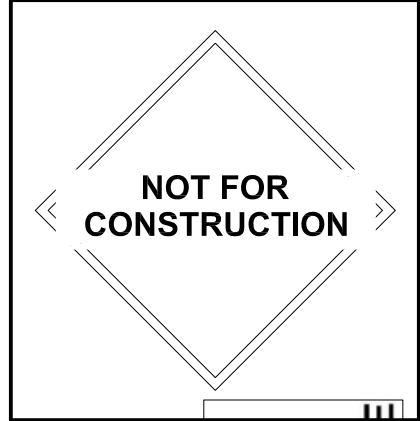
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CAUTION:
NOTE THAT ALL EXISTING UTILITIES MAY NOT BE SHOWN. ALL EXISTING SERVICE CONNECTIONS ARE NOT SHOWN. ANY EXISTING UTILITIES THAT ARE SHOWN ARE APPROXIMATE LOCATION ONLY. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT ALL THE UTILITY OWNERS AND TO CONDUCT ALL NECESSARY FIELD INVESTIGATIONS PRIOR TO ANY EXCAVATIONS TO DETERMINE THE ACTUAL LOCATION OF UTILITIES AND OTHER IMPROVEMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING UTILITIES, ETC.

project: 160804
date: 12.1.16
drawn: Author
checked: Checker

CONSULTANTS

APPLIED ENGINEERING AND SURVEYING, INC.

CIVIL ENGINEERING, LAND PLANNING AND SURVEYING

DRAINAGE CALCULATIONS

CIVD1