MAC WEST ADDITION

DRAINAGE REPORT

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1.0 General Information

1.1 Drainage Plan Files

See enclosed CD and paper copies of Drainage Plan (Exhibit 1-1), Preliminary Grading Plan (Exhibit 1-2), and One-Step Final Plat (Exhibit 1-3).

1.2 Professional Engineer's Seal

Final report includes sealed and signed cover sheet along with sealed and signed final drainage plan sheet.

1.3 Site Location Map

See Exhibit 1-4 for USGS Map and 1-5 for Aerial Photo of this area. The Mac West Addition is a more than 28-acre tract of land located in the Northeast Quarter of Section 14-T28S-R1W in the City of Wichita, Sedgwick County, Kansas. The area includes un-platted tracts inside the city. The site is bounded on the north by MacArthur Street, on the east by West Street, on the south by undeveloped property, and on the west by Union Pacific Railroad tracks.

1.4 Narrative of Development

The property is currently zoned to allow Limited Industrial use (refer to Exhibit 1-6 for Zoning information). It is anticipated that this site will be developed as a Limited Industrial (LI) subdivision. Typically, assumptions for design flows in an industrial area include up to 85% impervious area. A proposed detention pond shall occupy the south central portion of the property where storm runoff currently exits the site.

Presently, the entire area remains vacant prior to any future development, with the exception of some small single family uses near the north property boundary. As shown in the Drainage Plan (Exhibit 1-1), the drainage consists of one primary area. Run-off from the property traverses over land routes to the adjacent Valley Center Flood Control to the west and a series of existing detention cells to the southeast of the property in a residential development platted as Angel Fire Addition. Off-site runoff drains to existing roadway diches in MacArthur and West Street and is routed around the site to the north and the east . According to the NRCS Soil Survey, the predominant soil types within the property are Punkin-Taver Complex, Saltcreek and Naron Fine Sandy Loams and Tabler Silty Clay Loam series material. See Exhibit 1-8 for NRCS Soil Survey map and information showing existing soil types and descriptions.

The site lies adjacent to a FEMA Floodway (refer to Exhibit 1-9 for FIRM Panel 485E, Wichita, Sedgwick County, Kansas, February 2, 2007. No impact on storm water shall be addressed in the summary of runoff calculations text. The site does not contain wetland or riparian areas, and thus the development has no impact in that regard.

1.5 Discussion of Off-Site Conditions

Single-family and limited commercial areas are located directly east of this site. Limited Indusrial uses lie to the north, south and west (See Exhibit 1-6). The original, modern land use for the site was a mixture of residential and agricultural uses.

Total developed on-site drainage area equals 28.6 acres. The site development would route off-site drainage around the site through a series of existing ditches in MacArhur and West Street. Land use within the drainage basins varies between open space and single family in character. The existing grades convey storm water away from the subject property. Storm water is presently conveyed off-site through the previously discussed storm water sewer systems and overland flow channels (See Exhibit 1-1).

1.6 Summary of Runoff Calculations

	Offsite North of MacArthur Existing Conditions (24-Hour Storm) CN= 88.9 Tc(min)= 17.7 Area(Ac)= 33.98						Offsite North of MacArthur Proposed Conditions (24-Hour Storm) CN= 88.9 Tc(min)= 17.7 Area(Ac)= 33.98					
	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year
Flow (cfs)	67.44	91.89	127.08	151.69	183.23	242.42	67.44	91.89	127.08	151.69	183.23	242.42

	Offsite Ditches in Mac & West Existing Conditions (24-Hour Storm) CN= 88.6 Tc(min)= 6.7 Area(Ac)= 2.85						Offsite Ditches in Mac & West Proposed Conditions (24-Hour Storm) CN= 88.6 Tc(min)= 6.7 Area(Ac)= 2.85					
	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year
Flow (cfs)	7.59	10.32	14.25	17	20.52	27.12	7.59	10.32	14.25	17	20.52	27.12

	Lots to MacArthur Existing Conditions (24-Hour Storm) CN= 81.9 Tc(min)= 13.7 Area(Ac)= 2.21						Lots to MacArthur Proposed Conditions (24-Hour Storm) CN= 92.0 Tc(min)= 1.5 Area(Ac)= 2.21					
	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year
Flow (cfs)	3.37	4.95	7.32	9.02	11.23	15.42	5.40	7.13	9.58	11.28	13.46	17.55

	Lots to West Street Existing Conditions (24-Hour Storm) CN= 80.0 Tc(min)= 16.2 Area(Ac)= 2.70						Lots to West Street Proposed Conditions (24-Hour Storm) CN= 91.0 Tc(min)= 1.7 Area(Ac)= 2.70					
	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year
Flow (cfs)	3.68	5.56	8.39	10.44	13.12	18.22	6.35	8.46	11.46	13.55	16.23	21.24

	Site to Pond Existing Conditions (24-Hour Storm) CN= 83.4 Tc(min)= 177.1 Area(Ac)= 25.24						Site to Pond Proposed Conditions (24-Hour Storm) CN= 92.7 Tc(min)= 59.4 Area(Ac)= 25.24					
	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year	1-Year	2-Year	5-Year	10-Year	25-Year	100-Year
Flow (cfs)	8.04	11.79	17.41	21.46	26.73	36.77	28.72	37.85	50.83	59.86	71.41	93.09

Using the SCS Method, calculations were made to determine the existing flows from this site. Both the existing and proposed site drainage consists of one area as shown on the attached Drainage Plan, Exhibit 1-1. Off-site drainage is considered, and shall be routed around the north and east property line through a series of existing ditches and does not enter this study site. Each area is evaluated based on existing and proposed conditions.

On-site time of concentration was estimated for all separate drainage areas as shown in the summary table above. The Offsite North of MacArthur area's T_c was estimated to be approximately 17.7 minutes based upon the TR-55 method. This T_c does not change for the post-developed condition as this basin in already developed. The Offsite Ditches in MacArthur and West area's T_c was estimated to be approximately 6.7 minutes based upon the TR-55 method. This T_c does not change for the post-developed condition as this basin is already developed. The Lots to MacArthur area's T_c was estimated to be approximately 13.7

minutes based upon the TR-55 method and that becomes 1.5 minutes for the post-development condition. The Lots to West area's T_c was estimated to be approximately 16.2 minutes based upon the TR-55 method and that becomes 1.7 minutes for the post-developed condition. The Site to Pond area's T_c was estimated to be approximately 177.1 minutes based upon the TR-55 method and that becomes 59.4 minutes for the post-developed condition. On-site areas with a time of concentration less than 15 minutes will use a 15 minute T_c for the proposed condition. On-site detention to meet storage requirements as shown on the drainage plan shall be designed for the final development. It is assumed that immediate downstream capacities are adequate to handle current flows leaving this site. The final design of on-site drainage systems shall comply with current City of Wichita design criteria.

1.7 Narrative Description of Permanent Best Management Practices

The contractor shall provide stabilized construction entrance prior to any street paving. A buffer of 10 feet of undisturbed native vegetation shall be maintained around perimeter of site where possible. Earthwork stockpiles shall be maintained away from any ponds. Fuel storage and refueling of equipment shall not be allowed around any ponds, drainage channels, or other waterways. Sediment barriers will be placed at storm sewer inlets and rock rip-rap at outlets. Sediment barriers (type determined by owner or contractor) shall be used to prevent sediment from flowing off site. Disturbed earth shall be stabilized where construction activity ceases for at least 14 days with owner's choice of mulch, temporary seed (Rye grass) during the planting season or other suitable BMP device. BMP devices shall be in place until there is a good stand of grass. Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seed no later than 14 days after the last construction activity in that area (during the planting season only). The permanent seed shall consist of fescue or grass chosen by the owner. BMP devices shall be used at back of curb/edge of pavement until vegetation is 75% established.

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EXHIBIT 1-1

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EXHIBIT 1-9

2.0 Existing Conditions Information

2.1 Existing Conditions Drainage Map

See Existing Conditions Drainage Map on Exhibit 2-1.

2.1.1 On-Site and Off-Site Topography

The existing topography is shown on Exhibit 2-1.

2.1.2 On-Site and Off-Site Drainage Features

Exhibit 2-1 shows any water features within the site.

2.1.3 Storm Sewer System Components

Flow within the site is carried by overland flow, of which a majority is sheet flow. Roadway ditches along the north and south side of MacArthur Road drain this street to roadway ditches along the west side of West Street. Flow in West Street continues through a series of roadway ditches and ultimately outlets to the Valley Center Flood Control Drainage way.

2.1.4 Location and Boundaries of Natural Features

The site does not contain wetlands or lakes. A dry detention pond is proposed at the south central portion of the property.

2.1.5 Location, Dimensions, and Elevations of Existing Bridges and Culvert Crossings

There are no bridges or culvert crossings within the boundaries of this site. However, a series of ditches and culverts in MacArthur Road north of this development and West Street to the east of this development carry storm runoff from offsite properties to the Valley Center Flood Control Drainageway that lies south and west of the proposed Mac West Addition.

2.1.6 Location of Existing Utilities

Locates shall be called in prior to any excavation in this area. The site contains various utilities along the north side of the property. A sanitary sewer main runs along the south and a portion of the west property lines in a utility easement. A 12" water main is found along the north side of MacArthur. A 16" water main is found along the west side of West Street. Overhead power and/or telephone lines are found along the south side of MacArthur Road and the west side of West Street. Existing gas mains are found along the south side of MacArthur and the west side of West Street. Signal poles are located at the intersection of MacArthur Road and West Street.

2.1.7 Groundwater Elevations

This property is near a zone to the east identified by the City Engineers' office as likely to have groundwater at some or all times within 10 feet of the ground surface elevation. Building with specially engineered foundations or with the lowest floor opening above groundwater is recommended, and owners seeking building permits on this property will be similarly advised. More detailed information on recorded groundwater elevations in the vicinity of this property is available in the City Engineers' office.

2.1.8 Delineation of Predominate Soils Based on USDA Soil Surveys

The predominant soil type is a Tabler Silty Clay Loam (5967) series material, which is found in about 37.9% of the overall existing drainage areas. The drainage basin also contains 25.8% of Saltcreek and Naron Fine Sandy Loams (5943) soil and just over 26% of Punkin-Taver Complex (5832). See Exhibit 1-6 for NRCS Soil Survey map and information showing existing soil types and descriptions. These soils are classified as Hydrologic Group D (5832), Group C (5943), and Group D (5967)soils. The Hydrologic Groups are used to select curve numbers for the runoff calculations in both the existing and developed conditions.

2.1.9 Land Use Types per NRCS Nomenclature

The current land use type can be classified as cultivated crops and single family residential. Previous use of the land included cultivated crops.

2.1.10 Footprint of Existing Impervious Areas

Currently, the property is completely cleared for development with the exception of small impervious areas of single family residences and associated drives and out buildings near the north property line just south of MacArthur.

2.1.11 Internal Drainage Sub-Basin Boundaries

The total area of Mac West Addition encompasses 28.6 acres. The north basin denoted as Lots to MacArthur is approximately 2.2 acres and runs across the northern portion of the property as shown on the existing plan. The east basin denoted as Lots to West Street is approximately 2.7 acres and runs across the east portion of the property. The remainder of the site area is just over 25 acres and covers the balance of the site.

2.1.12 Time of Concentration Flow Paths

The existing condition drainage plan shows the general flow paths for each drainage area in the basin. The site drainage is all collected in the proposed on-site detention area and exits

the site to the south through and existing drainage way. The flow to these areas is mostly sheet flow with minor concentrated flow at the lower ends of the basins.

2.2 Existing Conditions Hydrology and Hydraulics Analysis

2.2.1 Narrative of the Hydrologic Analysis Methodology

The runoff method used to determine storm water flows was the SCS method. Supporting data and calculation results are shown on Exhibit 2-2. The analysis was completed using the SCS method. The 1, 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated.

2.2.2 Summary Table of Drainage Sub-Basin Hydrologic Parameters

Drainage Basin	Area (Acres)	Curve Number	T_c (min)
Lots to MacArthur	2.21	81.9	13.7
Lots to West Street	2.70	80.0	16.2
Site to Pond	25.24	83.4	177.1

2.2.3 Table of Existing Condition Runoff Curve Numbers

For the existing condition, the curve numbers were weighted based on area of their respective hydrologic soil groups over the site. The results are shown in the table below.

Offsite North of MacArthur		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Existing
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	430372.80	9.880	29.08%	91.0
5943	Saltcreek and Naron fine sandy loams, 0-1% Slopes	C	1049796.00	24.100	70.92%	88.0
		TOTALS	1480168.80	33.980	100.00%	88.9

Offsite MacArthur and West Ditches		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Existing
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	16698.00	0.383	13.45%	91.0
5832	Punkin-Taver complex, 0 to 1 percent slopes	D	6943.00	0.159	5.59%	91.0
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	100505.00	2.307	80.96%	88.0
		TOTALS	23641.00	2.850	100.00%	88.6

Lots to MacArthur		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Existing
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	27237.99	0.625	28.26%	84.0
5832	Punkin-Taver complex, 0 to 1 percent slopes	D	19405.21	0.445	20.13%	84.0
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	49747.54	1.142	51.61%	80.0
		TOTALS	96390.74	2.213	100.00%	81.9

Lots to West Street		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Existing
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	117612.00	2.700	100.00%	80.0
		TOTALS	117612.00	2.700	100.00%	80.0

Site to Pond		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Existing
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	519319.79	11.922	47.23%	84.0
5832	Punkin-Taver complex, 0 to 1 percent slopes	D	419058.35	9.620	38.12%	84.0
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	161076.26	3.698	14.65%	80.0
		TOTALS	1099454.40	25.240	100.00%	83.4

2.2.4 Table of Existing Condition Times of Concentration

Lots to MacArthur	13.7
Lots to West	16.2
Site to Pond	177.1

Supporting data and calculations are found on the time of concentration worksheet attached as Exhibit 2-3.

2.2.5 Summary Table of Rainfall Data

Rainfall information shown in Exhibit 2-4.

2.2.6 Cross-Section Data of Existing Open Channels

Located north of the north property line; the MacArthur Road ditch is a roughly 6'-wide flat-bottom channel with typical 4:1 side slopes draining to the Valley Center Flood Control Drainage way. Located east of the east property line; the West Street ditch is a v-bottom channel with typical 3:1 side slopes draining to the Valley Center Flood Control Drainage way. See Exhibit 2-5 for drainage calculations analyzing the capacity of the existing roadway ditches within the MacArthur Road and West Street right-of-way.

Note that a 10' drainage easement will be platted adjacent to the West Street Right-of-way to allow for widening of the existing West Street Ditch from a 6' to a 10' flat bottom width. This proposed widening will provide a final ditch section capable of carrying the 100 year storm event.

2.2.7 Existing Condition Hydrologic and Hydraulic Analyses

Existing condition analysis report attached as Exhibit 2-2.

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EXHIBIT 2-2

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EXHIBIT 2-3

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EXHIBIT 2-4

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EXHIBIT 2-5

3.0 Post-Development Conditions Information

3.1 Post-Development Conditions Drainage Map

3.1.1 Proposed Project Boundary

The one-step final plat showing property boundaries is included as Exhibit 1-3.

3.1.2 On-Site and Off-Site Topography

Topography in the area is shown on the drainage plan, Exhibit 1-1.

3.1.3 Existing On-Site and Off-Site Drainage Features Remaining

A proposed detention pond shall be constructed near the south central portion of the property and serve as detention for the proposed development. The storm sewer and ditch systems along MacArthur Road and West Street will remain unchanged with the exception of additional culverts under proposed drives and streets to provide access to the site. The storm sewer and ditch systems along MacArthur Road and West Street will continue to route flow around the site to the north and east.

A reserve will be dedicated or an easement recorded to accommodate the proposed detention cell upon final site design once site geometrics are better defined.

3.1.4 Location and Description of Off-Site Through-Drainage Conveyances

All offsite flows will continue to be routed around the site to the north and east by storm sewer and ditch systems in MacArthur Road and West Street. Required drainage improvements within these road right-of-ways due to this development is anticipated to be minimal.

3.1.5 Footprint of Proposed Impervious Areas

The total impervious area for the developed condition, estimated based on actual land use, is estimated at 85% of the drainage areas. Therefore, the total impervious area on the entire site could be up to 24.31 acres.

3.1.6 Location of Proposed Utilities

Proposed utilities shall be laid out as part of future construction plans to be submitted to the City for review. This shall include the extension of water and sewer mains to serve the proposed development and run along the planned public street right-of-way and in public utility easements. Storm sewer extensions to convey drainage within the site will be designed and submitted to the City for review once lot and easement lines are determined. The plat (Exhibit 1-3) shows proposed easements, which will be the location for any future

utilities. Additional utility easements likely will be dedicated by separate instrument as lot splits are recorded.

3.1.7 Delineation of Predominant Soils

The predominant soil type is discussed in section 2.1.8. See Exhibit 1-6 for NRCS Soil Survey map and information showing existing soil types and descriptions.

3.1.8 Land Use Cover per NRCS Nomenclature

All undisturbed areas within the site currently have fair grass or crop cover and/or heavy concentrations of trees and shrubs. The dry detention area along the south property line contains minimal tree cover.

3.1.9 Internal Drainage Sub-Basin Boundaries

The proposed drainage plan (Exhibit 1-1) delineates the proposed internal sub-basins and Exhibit 3-1 shows a table of the areas.

3.1.10 Proposed Limits of Land Disturbing Activity

Clearing and grading shall be done only as needed for development and will be established upon any submittal for site improvements.

3.1.11 Time of Concentration Flow Paths

The proposed drainage plan in Exhibit 1-1 shows the general flow paths for each drainage area in the three main basins. The sub-basin site drainage will be collected in proposed storm sewer systems and drain into the proposed detention pond located at to the south central portion of the property. Overflow beyond the design level of the pond flows to an existing channel south of the south property line and into the current Valley Center Flood Control Drainage Way. The flow to these areas is mostly sheet flow with minor concentrated flow at the lower ends of the basins. Offsite drainage flows around the site to the north and west in roadside ditches in MacArthur Road and West Street. The ditch ultimately drains into the Valley Center Flood Control Drainage Way.

3.2 Proposed Conveyances Map

3.2.1 On-Site and Off-Site Drainage Features Proposed

Existing conveyance systems are shown on Exhibit 1-1.

3.2.2 Storm Sewer System Components

Proposed changes to existing systems are discussed in Section 3.1.11 and further lot development would include adding grated or curb inlets at sump areas as needed in proposed parking areas or common access drives discharging to the MacArthur Road or West Street Ditches or the proposed detention cell near the south property line. The drainage plan shows the location of the proposed detention pond. Any additional storm sewer designs shall comply with the latest City of Wichita design criteria to convey any added site runoff.

3.2.3 Stormwater Flow for Sub-Basin or Drainage Area > 40 Acres

Proposed drainage areas and sub-basin do not exceed 40 acres.

3.2.4 Location of Stormwater Management Facilities

A proposed detention area located in the south central portion of the site shall be constructed to reduce proposed run-off and outlet in a manner similar to the existing flows controls.

3.2.5 Proposed Energy Dissipaters and Other Channel Protection Devices

The outlet for the proposed detention pond shall be lined with rip-rap to dissipate energy and limit erosion.

3.2.6 Locations and Dimensions of Proposed Channel, Bridge, and Culvert Crossings

A pumped pond outlet will be located near the southwest corner of the property and discharge to the existing drainage swale that runs through the adjoining property to the south near the existing railroad tracks.

3.2.7 Normal Pool and 100-Year Pool Elevations for Ponds and Lakes

The dry detention pond shall have a 100 year design water surface elevation of 1283.31. A series of gravel filled frecnh drains will drain the proposed detention cell to the water table which is anticipated to be found at an elevation of 1275+/-. See Exhibit 1-1 for layout of the pond. Ponding will remain within the confines of the proposed detention cell and will not enter adjoining lots in the 100 year rainfall event.

3.2.8 Permanent Concrete Outfall Control Structures for Ponds

Since all runoff routed to the proposed detention cell is to be drained to the water table, a permanent concrete outfall control structure is not included as part of this detention cell design.

3.2.9 Emergency Overflow Spillways and Top of Berm Elevations for Ponds

Overflow from the pond shall continue past the overflow weirs and into the existing drainage ditches in West Street and the Railroad Right-of-Way. The top of berm elevation around to pond shall be no less than a 1285.5.

3.2.10 Floodplains, Ponds, and Stormwater Management Facilities Located in Reserves

This site is not within the limits of a delineated FEMA Floodplain. The proposed detention pond shall be within a reserve as shown by the plat. The Drainage Plan shows this proposed reserve area for the pond as well. It is expected that the final location of the pond be determined as part of the final design and grading plans for the property. Changes to this Drainage Plan must be approved by the appropriate governing body prior to issuing any building permit to ensure that drainage requirements are met.

3.3 Post-Development Conditions Hydrology and Hydraulics

3.3.1 Narrative of the Hydrologic Analysis Methodology

The analysis was completed using the SCS Hydrograph method. The 1, 2, 5, 10, 25, & 100 year, 24-hour storm events were evaluated. The analysis information appears in Exhibit 3-2.

3.3.2 Summary Table of Drainage Sub-Basin Hydrologic Parameters

Drainage Basin	Area (Acres)	Curve Number	T_c (min)
Lots to MacArthur	2.21	92.0*	15.0
Lots to West Street	2.70	91.0*	15.0
Site to Pond	25.24	92.7*	59.4

*Curve numbers shall be revised if total site imperviousness exceeds the 70% currently anticipated.

3.3.3 Table of Post-Development Condition Runoff Curve Numbers

For the post-development condition, the curve numbers were weighted based on area of their respective hydrologic soil groups over the site and include adjustment for impervious areas. The results are shown in the table below.

Lots to MacArthur		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Proposed
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	27237.99	0.625	28.26%	93.0
5832	Punkin-Taver complex, 0 to 1 percent slopes	D	19405.21	0.445	20.13%	93.0
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	49747.54	1.142	51.61%	91.0
		TOTALS	96390.74	2.213	100.00%	92.0

Lots to West Street		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Proposed
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	117612.00	2.700	100.00%	91.0
		TOTALS	117612.00	2.700	100.00%	91.0

Site to Pond		Hydrologic	Area		% of Area	CN
Soil #	Soil Information	Group	Square Feet	Acres	%	Proposed
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	519319.79	11.922	47.23%	93.0
5832	Punkin-Taver complex, 0 to 1 percent slopes	D	419058.35	9.620	38.12%	93.0
5943	Saltcreek and Naron fine sandy loams, 0-1% slopes	C	161076.26	3.698	14.65%	91.0
		TOTALS	1099454.40	25.240	100.00%	92.7

3.3.4 Table of Post-Development Condition Times of Concentration

Area	T_c (min)
Lots to MacArthur	15.0
Lots to West Street	15.0
Site to Pond	59.4

Supporting data and calculations are found on the time of concentration worksheet attached as Exhibit 3-3.

3.3.5 Cross-Sections and Other Diagrams of Hydraulic Features

All proposed channels/ditches shall have maximum side slopes of 4:1.

3.3.6 Hydrologic and Hydraulic Analyses

Post-development condition analysis report attached as Exhibit 3-2.

3.3.7 Downstream Peak Discharge Assessment (10% Rule)

Runoff from this site, with the exception of those areas that are proposed to drain to MacArthur and West Streets, will be routed to a proposed detention/retention pond and then allowed to infiltrate to the water table.

3.3.8 Stage-Storage-Discharge Curves

Storage curve was computed for the volume of water that could be stored for proposed runoff within the south central drainage area. Exhibit 3-2 includes design information for the

detention pond along with all hydrograph data. The resulting stage-storage-discharge table is shown on the Drainage Plan as well (Exhibit 1-1). All storm events' proposed outflow through the pond give a significant decrease in post-developed flows in relation to existing flows as discussed for an overall reduction of flows to the adjoining property to the south.

3.3.9 Pond Contours on the Master Grading Plan

The detention pond and proposed location is shown on the Drainage Plan (Exhibit 1-1). The pond shall be constructed with the initial phase of development and will be shown as part of the master grading plan.

Development within areas A and B as shown on the proposed drainage plan shall provide their own individual detention.

3.3.10 One Foot of Freeboard Above the 100-Year, 24-Hour High Water Level

The freeboard for the detention facility is a minimum of one foot (1') above the proposed design water surface elevation. The top of the pond in the design calculations was set to an elevation of 1285. The HWL designed for the pond is 1283.31.

3.3.11 Runoff Discharge Comparison

No relevant impacts are noted from this analysis. With the dry detention system, flows are not increasing out of that system and therefore have no impact on the downstream existing channel.

3.4 Stormwater Quantity Control Sizing

3.4.1 Hydraulic Sizing Calculations

Storm water controls will include appropriate inlet and pipe networks at locations to be finalized as part of the construction plans. No proposed layouts of storm sewer networks have been included as part of this drainage study, as end uses and lot configurations of this property have yet to be determined. Pipe networks to convey the five-year storm at a minimum will be designed as industrial users come online. Sump locations in specific drainage areas will have flows routed overland to other low points and carried through the remainder of the system.

3.4.2 Table of Stormwater Quantity Management Controls

A summary table of the proposed storm sewer networks has not been included in this report as final lot configurations are not known at this time. A supplementary drainage study will be submitted including these calculations once lot configuration is better defined.

3.4.3 Typical Details

All structures shall conform to City of Wichita standards.

3.5 Stormwater Quality Management Facilities

3.5.1 Table of Stormwater Quality Management Facilities

Facilities are listed in Exhibit 3-5.

3.5.2 Maintenance Responsibility of Stormwater Management Facilities

The maintenance of storm water management facilities shall be the responsibility of the owner and shall be transferred to new owner upon the sale of any part thereof.

3.5.3 Water Quality Volume

Water quality volume calculated on Exhibit 3-6. All future lot developments shall address specific water quality requirements for each outlet to the downstream receiving channels and ultimately the Valley Center Flood Control Drainageway.

3.5.4 % TSS Removal Value

Values for each basin shown on Exhibit 3-5.

3.5.5 Channel Protection Volume

An equivalent 8" outlet pipe will be used to drain the basin. This pipe(s) will be attached to a series of structures with a cumulative weir length of 9' (3' in each of three structures) used to drain the proposed dry detention basin. Channel protection sizing is shown in exhibit 3-6. Low flows will be detained for 30+ hours as shown.

3.5.6 Water Quality Volume and Channel Protection Volume Orifice Sizing

Sizing and design of water quality measures will be addressed in a supplemental study once site configuration and lot layout is better defined.

3.5.7 Additional Calculations

No additional calculations at this time.

3.5.8 Typical Details

All structures shall conform to City of Wichita standards.

MAC WEST ADDITION

EXHIBIT 3-1

MAC WEST ADDITION

EXHIBIT 3-2

MAC WEST ADDITION

EXHIBIT 3-3

MAC WEST ADDITION

EXHIBIT 3-4

MAC WEST ADDITION

EXHIBIT 3-5

MAC WEST ADDITION

EXHIBIT 3-6

4.0 Floodplains

4.1 Source of Flood Profile

Current FEMA mapping attached as Exhibit 1-9.

4.2 Nearest Base Flood Elevations

Existing base flood elevations are not applicable as this site is Levee Protected.

4.3 Delineation of Pre-Development Regulatory Floodplain/Floodway Limits

Current FEMA mapping attached as Exhibit 1.9.

4.4 Delineation of Post-Development Regulatory Floodplain/Floodway Limits

Site development will not affect current FEMA mapping.

4.5 Floodplain Data Table and Discharges

This site is outside the mapped FEMA Floodplain and is Levee Protected.

4.6 Hydrologic and Hydraulic Study Information

This site is outside the mapped FEMA Floodplain and is Levee Protected.

4.7 Provide regulatory floodway and four natural profile models (10, 50, 100, & 500-yr) for existing and future watershed conditions

This site is outside the mapped FEMA Floodplain and is Levee Protected.

4.8 Floodplains and Floodways Located within a Reserve

Not applicable to this development.

MAC WEST ADDITION

EXHIBIT 4-1

5.0 Federal, State, and Local Permits

5.1 US Army Corps of Engineers Regulatory Program Permits

Not applicable to this development.

5.2 Kansas Department of Agriculture Division of Water Resources Permits

Not applicable to this development.

5.3 Federal Emergency Management Agency (FEMA) Letter of Map Changes

Not applicable to this development.

6.0 Preliminary Master Grading Plan

See Exhibit 1-2 for Preliminary Grading Plan.