Trepanier Engineering
Professional Civil Engineering

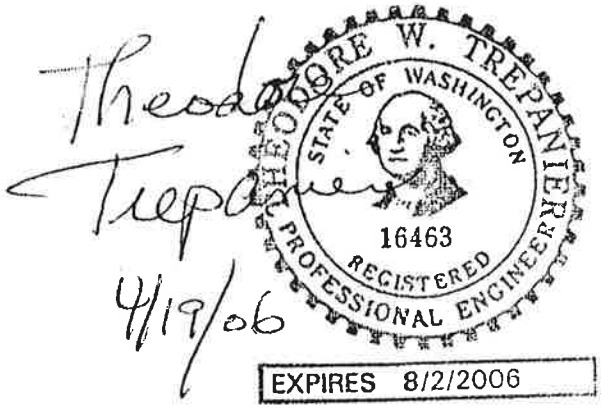
DRAINAGE REPORT

FOR

59TH AVE EAST
COMMERCIAL BUILDINGS

FOR

4 T DEVELOPMENT, LLC



BY

TREPANIER ENGINEERING

APRIL 13, 2006

1420 Hewitt • Everett, Washington 98201 • Everett (425) 259-5556 • FAX (425) 259-5558

INTRODUCTION

The site is located in on the east side of 59th Ave. approximately 500 feet south of the intersection with 172nd. The site is flat but generally slopes north to south. The project size is about 4.6 acres in size.

PLANNED DEVELOPMENT

The proposal is for two warehouses buildings located on the site and parking and driveways. The buildings will have loading docks and handicapped parking spots.

EXISTING DRAINAGE CONDITIONS

The site currently drains north to south into an existing Retention/Detention pond located on the south side of the future 169th St. NE. The pond has not been sized for the development of this property. The water table is fairly high for this area and a geotechnical company completed piezometer measurements and recordings during winter/spring 2006. A preliminary drainage report was completed which showed that infiltration was feasible on the site.

PLANNED DRAINAGE CONDITIONS

The proposed drainage solution will be broken into three separate drainage systems. The two buildings will have their downspouts connected and the stormwater discharged into separate infiltration systems located south of the buildings. The raw stormwater discharged onto the buildings will be clean and the rooftops are also assumed clean, so no Water Quality measures are proposed. The infiltration trenches will be sized as per the recommendations of the geotechnical engineer. The design of the trenches will follow the format for the building rooftops for the Gale Insulation Building.

For the pavement storm drainage, we are proposing to collect all pavement drainage into individual Stormwater Filter Manholes (approximately a maximum of 1 acre per treatment manhole or 3 for the site and direct the road/asphalt parking drainage to a lift state for pumping to the Gale Insulation Building site (4T Development) to the west. This system was expanded during the construction to include the area of asphalt for this site. In addition, emergency overflows were adjusted from the original approved plans and an 18 inch casing was installed across 59th to account for the future lift station piping.

Preliminary Drainage calculations follow for the three systems:

BUILDINGS (1 AND 2)

Area per building is 0.71 acres plus .16 acres of landscaping tributary to the infiltration trench.

Rainfall for the site is

6 month at	1.15 inches
2 year at	1.8 inches
10 year at	2.6 inches
100 year at	3.7 inches

The soils are a Custer Soil with a tabulated infiltration rate. Western Geotechnical ran soils distribution curves and recommended and infiltration rate of 3.5 inches/hour. Using a factor of safety at 2.0 we have input 1.75 in/hr as our infiltration rate. We have used the conservative void ratio of 0.3 for washed gravel but may investigate other materials during final design. This results in a dispersion trench of 13 feet wide by 250 feet long with a depth of 2.6', but use 3 feet deep.

PARKING AND DRIVEWAYS

Area = 2.40 acres impervious and 0.44 acres pervious, including all site area except the landscaped areas south of the buildings.

The soils are a Custer Soil with a tabulated infiltration rate of 0.27 in/hr. Western Geotechnical previously calculated the infiltration rate on the Gale site of 2.4 in/hr which was used to size that infiltration field. Using a factor of safety at 2.0 we have input 1.205 in/hr as our infiltration rate. We have used the conservative void ratio of 0.3 but may investigate other materials during final design.

Doing this has resulted in an equivalent 75' x 240' drainfield basically located south of the main entrance from 59th and into the property. This field has already been constructed with an 18" casing crossing 59th connecting the site. The calculated flow depth is approximately 2.0 feet deep.

For water quality we are proposing a series of Stormwater Filter manholes. These are approximately sized for 1 acre of tributary area to each special manhole.

The pump to carry the water to the Gale site will be sized for the 100 year storm or about 1000 gpm. The vault and pump will be further sized as the project design is completed.

In addition, a gravity high water bypass (corresponding to a 10 or 100 year storm) is also provided from the downstream pump station. Water will flow onto 169th and into the existing pond or if it is already into the infiltration field and there is a failure at that location, the water will overflow into the existing ditch along the south line of the Gale site.

OPERATION AND MAINTENANCE

The soils are marginal for infiltration. Therefore, the system needs to be maintained on a regular basis to prolong the life of the infiltration bed.

These include:

1. Clean catch portion of all catch basins four times per year;
2. Sweep asphalt areas monthly;
3. Pump out o/w separator four times per year;
4. Continue maintenance contract with Stormwater Management at least once per year and change media;
5. Inspect infiltration trench at cleanouts yearly and flush when sediment deposits get to 1" or greater. Note that most of sedimentation will occur within 50 feet of the inlet basin.
6. Replace storm pump after 3 years.

BUILDINGS

Appended on: 13:52:52 Wednesday, April 19, 2006

LPOOLCOMPUTE [POND] SUMMARY using Puls

Start of live storage: 100.0000 ft

Event	Match Q (cfs)	Peak Q (cfs)	Peak Stg (ft)	Vol (cf)	Vol (acft)	Time to Empty
2 year	0.3452	0.1317	100.5395	526.04	0.0121	25.00
10 year	0.5111	0.1317	101.2191	1188.61	0.0273	25.17
100 year	0.7370	0.1317	102.6672	2600.51	0.0597	26.83

Running \\\\S0032809371\\SharedDocs\\APROJECTS - Old Activ & 2004-2005\\05-023 59TH AVE EAST\\POND Report.pgm on Wednesday, April 19, 2006

Summary Report of all Detention Pond Data

Event	Precip (in)
6 MONTH	1.1500
2 year	1.8000
10 year	2.6000
100 year	3.7000

BASLIST2
[BUILDINGS] Using [TYPE1A] As [2 year]
[BUILDINGS] Using [TYPE1A] As [2 year]
[BUILDINGS] Using [TYPE1A] As [10 year]
[BUILDINGS] Using [TYPE1A] As [10 year]
[BUILDINGS] Using [TYPE1A] As [100 year]
[BUILDINGS] Using [TYPE1A] As [100 year]
LSTEND

BasinID	Event	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-cf)	Area (ac)	Method/Loss	Raintype
BUILDINGS	2 year	0.3452	8.01	0.1138	0.87	SCS/SCS	TYPE1A
BUILDINGS	2 year	0.3452	8.01	0.1138	0.87	SCS/SCS	TYPE1A
BUILDINGS	10 year	0.5111	8.01	0.1718	0.87	SCS/SCS	TYPE1A
BUILDINGS	10 year	0.5111	8.01	0.1718	0.87	SCS/SCS	TYPE1A
BUILDINGS	100 year	0.7370	8.01	0.2516	0.87	SCS/SCS	TYPE1A
BUILDINGS	100 year	0.7370	8.01	0.2516	0.87	SCS/SCS	TYPE1A

BASLIST [TYPE1A] AS [2 year] DETAILED
[BUILDINGS]
LSTEND

Record Id: BUILDINGS

Design Method	SCS	**Rainfall type**	TYPE1A
Hyd Intv	10.00 min	**Peaking Factor**	484.00
		Abstraction Coeff	0.20
Pervious Area	0.00 ac	**DCIA**	0.87 ac
Pervious CN	0.00	**DC CN**	98.00
Pervious TC	0.00 min	**DC TC**	5.00 min

Directly Connected CN Calc

Description	SubArea	Sub cn
BUILDINGS AND ADJACENT LAWN	0.87 ac	98.00
DC Composited CN (AMC 2)		98.00

Directly Connected TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Fixed	BY INSPECTION					5.00 min
Directly Connected TC						5.00min

HYDLIST SUMMARY
[2 year out] [10 year out] [100 year out]
LSTEND

HydID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Cont Area (ac)
2 year out	0.1317	7.67	0.1138	0.8700
10 year out	0.1317	6.83	0.1719	0.8700
100 year out	0.1317	5.33	0.2515	0.8700

STORLIST
[TRENCH]
LSTEND

Record Id: TRENCH

Descrip:	Prototype Record	Increment	0.10 ft

Start El.	100.0000 ft	Max El.	108.0000 ft
Length	13.0000 ft	Width	250.0000 ft
Catch	30.0000	Consider Bottom Only	

DISCHLIST
[INFILTRENCH]
LSTEND

Record Id: INFILTRENCH

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	100.0000 ft	Max El.	105.0000 ft
Infiltration rate	1.7500 in/hr	WP Multiplier	1.00

PARKING AREA

History Cleared: 14:03:41 Wednesday, April 19, 2006

LPOOLCOMPUTE [CROWNPOOL] SUMMARY using Puls

Start of live storage: 100.0000 ft

Event	Match Q (cfs)	Peak Q (cfs)	Peak Stg (ft)	Vol (cf)	Vol (acft)	Time to Empty
2 year	1.0187	0.5021	100.2345	1266.51	0.0291	25.67
10 year	1.5496	0.5021	100.5431	2932.71	0.0673	25.83
100 year	2.2845	0.5021	101.1978	6468.35	0.1485	26.00

Running \\\\S0032809371\\SharedDocs\\APROJECTS - Old Activ & 2004-2005\\04-005 4T Develop. Gale Insul\\CROWNPOOL Report.pgm on Wednesday, April 19, 2006

Summary Report of all Detention Pond Data

Event	Precip (in)
other	1.1500
2 year	1.8000
10 year	2.6000
100 year	3.7000

BASLIST2
[EDTHOMAS] Using [TYPE1A] As [2 year]
[EDTHOMAS] Using [TYPE1A] As [2 year]
[EDTHOMAS] Using [TYPE1A] As [10 year]
[EDTHOMAS] Using [TYPE1A] As [10 year]
[EDTHOMAS] Using [TYPE1A] As [100 year]
[EDTHOMAS] Using [TYPE1A] As [100 year]
LSTEND

BasinID	Event	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-cf)	Area (ac)	Method/Loss	Raintype
EDTHOMAS	2 year	1.0187	8.00	0.3395	2.84	SCS/SCS	TYPE1A
EDTHOMAS	2 year	1.0187	8.00	0.3395	2.84	SCS/SCS	TYPE1A
EDTHOMAS	10 year	1.5496	8.00	0.5226	2.84	SCS/SCS	TYPE1A
EDTHOMAS	10 year	1.5496	8.00	0.5226	2.84	SCS/SCS	TYPE1A
EDTHOMAS	100 year	2.2845	8.00	0.7773	2.84	SCS/SCS	TYPE1A
EDTHOMAS	100 year	2.2845	8.00	0.7773	2.84	SCS/SCS	TYPE1A

BASLIST [TYPE1A] AS [2 year] DETAILED
[EDTHOMAS]
LSTEND

Record Id: EDTHOMAS

Design Method	SCS	**Rainfall type**	TYPE1A
Hyd Intv	10.00 min	**Peaking Factor**	484.00
		Abstraction Coeff	0.20
Pervious Area	0.44 ac	**DCIA**	2.40 ac
Pervious CN	86.00	**DC CN**	98.00
Pervious TC	5.00 min	**DC TC**	5.00 min

Pervious CN Calc

Description	SubArea	Sub cn
LANDSCAPED AREAS	0.44 ac	86.00
Pervious Composited CN (AMC 2)		86.00

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Fixed	BY INSPECTION					5.00 min
Pervious TC						5.00 min

Directly Connected CN Calc

Description	SubArea	Sub cn
TOTALEAST OF 59TH	2.40 ac	98.00
DC Composited CN (AMC 2)		98.00

Directly Connected TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Fixed	by inspection					5.00 min
Directly Connected TC						5.00min

HYDLIST SUMMARY
[2 year out] [10 year out] [100 year out]
LSTEND

HydID	Peak Q (cfs)	Peak T (hrs)	Peak Vol (ac-ft)	Cont Area (ac)
2 year out	0.5021	7.83	0.3395	2.8400
10 year out	0.5021	7.50	0.5225	2.8400
100 year out	0.5021	6.50	0.7773	2.8400

STORLIST
[CROWNSITEFIELD]
LSTEND

Record Id: CROWNSITEFIELD

Descrip:	Prototype Record	Increment	0.10 ft
Start El.	100.0000 ft	Max El.	102.0000 ft
Length	75.0000 ft	Width	240.0000 ft
Catch	30.0000	Consider Bottom Only	

DISCHLIST
[GOODPERC]
LSTEND

Record Id: GOODPERC

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	100.0000 ft	Max El.	105.0000 ft
Infiltration rate	1.2050 in/hr	WP Multiplier	1.00