APPENDICES

APPENDIX - A Parking Lot Sediment Basin Volumes Spreadsheet

Storage Volumes for Parking Area Detention Basins

Methodology

Basins using outlet control structures and drainage pipe.

1 Estimate Vs, the storage capacity of sediment basins (utilizing drain pipe) required to attenuate peak discharges under the capacity of drainage pipe utilized during construction.
Ref. USDA Urban Hydrology for Small Watershed, TR-55, Technical Release 55, Chapter 6, Storage Volume for Detention Basins.

2 Compare Vs to the volumes of permanent stormwater basins utilized during construction.

Basins using stone outlet weirs

1 Estimate the storage capacity of sediment basins (utilizing stone outlet weirs) using the Bluebook criteria of 3,600 CF per acre of drainage area.

qo	peak capacity flow of drydention basins. Peak flows will be limited to this number
Q	Runoff inches. Determined from TR-55 Worksheet 2
Vr	Runoff Volume acre feet 53.33Q(Am)
Am	Area (mi2) draining to basin
qi	Peak inflow discharge Determined from TR-55 worksheet 4
Vs	Storage Volume acre feet Dryswale detention basins reqd to attenuate peak flows

Upper Discovery Parking Area

Phase	Basin	Q	Am	Vr	qi (cfs)	post const qi (cfs)	qo (cfs)	qo/qi	Vs/Vr	Vs acre fee	Vs cubic feet
2	Drydet C	3.7	0.008	1.665	22.6	22.6	10.16	0.450	0.2	0.33	14505
3	Drydet B	4.4	0.006	1.393	26.8	28	10.82	0.386	0.235	0.33	14262
4	Drydet A	4.52	0.006	1.394	25.1	27.6	10.1	0.366	0.245	0.34	14873
5	Drydet E	5	0.002	0.625	16.4	16.4	25.69	1.566	0.315	0.20	8575

Phase	Basin	Minimum Volume Vs CF	Available Volume Drydet	
1	Drydet G&H	18000	71,238	(Drydet G 16403 + Drydet H 54835)
2	Drydet C	14505	23570	
3	Drydet B	11787	23570	
4	Drydet A	14873	23590	
5	Drydet E	8575	37739	(Detention Basin 21840 + Swale 15899)

East Parking Area

Phase	Basin	Q	Am	Vr	qi (cfs)	qo (cfs)	qo/qi	Vs/Vr	Vs acre	Vs cubic feet
2b	Drydet A	4.6	0.007	1.763	31.6	6.84	0.216	0.37	0.65	28418
2a	Drydet 1	4.6	0.004	0.920	24.2	10.71	0.443	0.2	0.18	8015
1	Bioret1	4.600	0.001	0.345	6.4	1.570	0.245	0.33	0.11	4959

Note: Drydet 1 Qi=6.84 (drydeta) +17.3 (phase2b)

Phase		Minimum Volume Vs CF	Total Available Volume	Available Volume Drydet	Available Volume Swales	Available Length
2b	Drydet a	28418	33399	18284	15115	203
2a	Drydet 1	25200	25200	(25200 based on 7 acre drainage area (conservative))		
1	Bioret 1	.9 acre	4959	7790		
	Bioret 2	.43 acre	1548	12634	Culvert capacity not constraining	

North Discovery Parking Area

Phase	Basin Stone Outlet	Drainage Area	Vol. reqd	length	width	depth	Vol Avail.
1	1	0.37 acre	1322	30	15	3	1350
	2	0.4 acre	1455	49	10	3	1470
	3	0.26 acre	926	31	10	3	930
	4	0.55 acre	1983	44	15	3	1980

Phase 1 temporary stone outlet sediment basin volume are calculated by multiplying drainage area by 3600.

Stone Weir outlets are centered on downhill edge of basins.

	Basin	Q	Am	Vr	qi (cfs)	qi (cfs)	qo (cfs)	qo/qi	Vs/Vr	Vs acre fee	Vs cubic feet
1	Drydet A	4.4	0.006	1.467	22	22	9.41	0.428	0.31	0.45	19804

	Basin	Minimum Volume Required	Total Available Volume	Available Volume Drydet	Available Volume Swales	Available Length
1	Drydet A	19804	76809	23590	53219	600

APPENDIX - B Cut and Fill Volumes

East Parking Lot Areas

5/22/2009

Area	Cut	Fill	Net	Initial Data Reduction Cut/Fill	Volume CY +Cut /-Fill
EP-C					
EP-A	4024.22 Cu. Yd.	1153.41 Cu. Yd.	2870.81 Cu. Yd.<Cut>	Cut	2,871
EP-B	1572.13 Cu. Yd.	154.41 Cu. Yd.	1417.73 Cu. Yd.<Cut>	Cut	1,418
West End Drives - approximate number	2166.36 Cu. Yd.	4555.09 Cu. Yd.	2388.73 Cu. Yd.<Fill>	Fill	-2,389
Entrance Drive from Town Road 0+00 up to past HP at 2+50	940.12 Cu. Yd.	216.39 Cu. Yd.	723.73 Cu. Yd.<Cut>	Cut	724
Entrance Drive from Town Road 2+50 up to Tier C	2236.90 Cu. Yd.	14.83 Cu. Yd.	2222.07 Cu. Yd.<Cut>	Cut	2,222
Tier B exit Ramp Down	587.17 Cu. Yd.	2693.31 Cu. Yd.	2106.14 Cu. Yd.<Fill>	Fill	-2,106
Tier A exit Ramp Down	0.00 Cu. Yd.	1222.06 Cu. Yd.	1222.06 Cu. Yd.<Fill>	Fill	-1,222
	835.05 Cu. Yd.	75.42 Cu. Yd.	759.63 Cu. Yd.<Cut>	Cut	760
	12,362	**10,085**		**Subtotal**	**2,278**
Kiosk Parking Area		281.46		Fill	-281
Sandfilter Area	2352.63			Cut	2,353
DryDetentionPond2	699			Cut	699
	3051.63	**281.46**		**Subtotal**	**2,770**
	15,414	**10,366**		**TOTAL**	**5,048**

East Parking Lot Areas on Tier EP-B Divided into subareas			5/29/2009	Initial Data Reduction	
Area	Cut	Fill	Net	Cut/Fill	Volume CY +Cut /-Fill
125 to 270	13713	7582	6131	C	
278 to 322	580	128	452	C	
330 to 595	849	4037	3188	F	
445 to 595	425	2921	2496	F	

Upper Discovery Parking Lot Areas on Tiers and Roads Divided into subareas as of 6/19/09			6/19/2009	Initial Data Reduction	
Area	Cut	Fill	Net	Cut/Fill	Volume CY +Cut /-Fill
Loop 0+00 to 4+25	151.66 Cu. Yd.	439.40 Cu. Yd.	287.74 Cu. Yd.<Fill>	Fill	-288
Loop 425 to 660	310.39 Cu. Yd.	36.32 Cu. Yd.	274.07 Cu. Yd.<Cut>	Cut	274
Loop 660 to 1172	1259.26 Cu. Yd.	100.32 Cu. Yd.	1158.94 Cu. Yd.<Cut>	Cut	1,159
Loop 1172 to 1883	7296.21 Cu. Yd.	6277.29 Cu. Yd.	1018.92 Cu. Yd.<Cut>	Cut	1,019
Loop 1883 to 3076	558.12 Cu. Yd.	3791.32 Cu. Yd.	3233.21 Cu. Yd.<Fill>	Fill	-3,233
				Subtotal	**-1,055**
Tier A West	686.71 Cu. Yd.	107.95 Cu. Yd.	578.75 Cu. Yd.<Cut>	Cut	579
Tier A Parking	3162.39 Cu. Yd.	3749.05 Cu. Yd.	586.66 Cu. Yd.<Fill>	Fill	-587
Tier A East	32.37 Cu. Yd.	621.86 Cu. Yd.	589.49 Cu. Yd.<Fill>	Fill	-589
				Subtotal	**-597**
Tier B West	1266.35 Cu. Yd.	103.72 Cu. Yd.	1162.62 Cu. Yd.<Cut>	Cut	1,163
Tier B Parking	6987.07 Cu. Yd.	7787.18 Cu. Yd.	800.11 Cu. Yd.<Fill>	Fill	-800
Tier B East	77.07 Cu. Yd.	110.13 Cu. Yd.	33.06 Cu. Yd.<Fill>	Fill	-33
				Subtotal	**330**
Tier C West	1298.68 Cu. Yd.	114.70 Cu. Yd.	1183.99 Cu. Yd.<Cut>	Cut	1,184

Tier C Parking	4768.43 Cu. Yd.	6662.42 Cu. Yd.	1893.99 Cu. Yd.<Fill>	Fill	-1,894
Tier C East	1170.94 Cu. Yd.	117.97 Cu. Yd.	1052.97 Cu. Yd.<Cut>	Cut	1,053
				Subtotal	**343**

North Parking Lot Divided into subareas

1/27/2010

Area	Cut	Fill	Net	Initial Data Reduction Cut/Fill	Volume CY +Cut /-Fill
PR North Parking Lot TTL	10180.49 Cu. Yd.	12543.85 Cu. Yd.	2363.36 Cu. Yd.<Fill>	Fill	-2,363
Entrance Drive to 5+45	3047.84 Cu. Yd.	96.00 Cu. Yd.	2951.85 Cu. Yd.<Cut>	Cut	2,952
Lower Tier to 9+11	4410.83 Cu. Yd.	1899.86 Cu. Yd.	2510.97 Cu. Yd.<Cut>	Cut	2,511
Lower Tier (9+11 to 12+40)	557.30 Cu. Yd.	5249.45 Cu. Yd.	4692.16 Cu. Yd.<Fill>	Fill	-4,692
Single Lane Between Tiers	0.01 Cu. Yd.	1554.86 Cu. Yd.	1554.85 Cu. Yd.<Fill>	Fill	-1,555
Upper Tier to (14+75.10 to 17+1	625.96 Cu. Yd.	2594.87 Cu. Yd.	1968.91 Cu. Yd.<Fill>	Fill	-1,969
Upper Tier 17+11 to end	835.63 Cu. Yd.	1029.45 Cu. Yd.	193.82 Cu. Yd.<Fill>	Fill	-194
Single Lane 19+40.11 to end	507.58 Cu. Yd.	0.06 Cu. Yd.	507.52 Cu. Yd.<Cut>	Cut	508
				Subtotal	**-2,439**

Raw Volumetric Data Imported from CAD Models

5/22/2009

Index	Base Surface	Comparison Surface	Cut	Fill	Net	Initial Data Reduction Cut/Fill	Volume CY +Cut /-Fill
East Parking Lot Area As of 5/14/09							
1	EG in East Parking Lot Area	PR East Parking Corridor Surfac	see East Parking Below	see East Parking Below	see East Parking Below		5,048
						Subtotal	**5,048**
North Parking Lot Area as of 5/14/09							
Index	Base Surface	Comparison Surface	Cut	Fill	Net		
1	East Parking Lot Area	North Parking Lots	10207.85 Cu. Yd.	12552.76 Cu. Yd.	2344.92 Cu. Yd.<Fill>	Fill	-2,345
			10,208	**12,553**		**Subtotal**	**-2,345**
Upper Discovery Parking Lot Area as of 5/18/09							
Index	Base Surface	Comparison Surface	Cut	Fill	Net		
1	Discovery Parking EG	Loop Road Surface - (42)	9619.91 Cu. Yd.	10611.92 Cu. Yd.	992.01 Cu. Yd.<Fill>	Fill	-992
2	Discovery Parking EG	Tier 2 Surface - (17)	3846.44 Cu. Yd.	4400.12 Cu. Yd.	553.67 Cu. Yd.<Fill>	Fill	-554
3	Discovery Parking EG	Tier 3 Surface - (18)	8287.61 Cu. Yd.	8001.25 Cu. Yd.	286.36 Cu. Yd.<Cut>	Cut	286
4	Discovery Parking EG	Tier 4 Surface - (19)	6992.05 Cu. Yd.	6895.26 Cu. Yd.	96.79 Cu. Yd.<Cut>	Cut	97
5	Discovery Parking EG	Entrance Surface - (41)	962.80 Cu. Yd.	1630.21 Cu. Yd.	667.41 Cu. Yd.<Fill>	Fill	-667
6	Discovery Parking EG	Stormwater Piping System Surfa	888.77 Cu. Yd.	0.32 Cu. Yd.	888.44 Cu. Yd.<Cut>	Cut	888
7	Discovery Parking EG	DRYDETE 012810 Surface	1061.95 Cu. Yd.	26.18 Cu. Yd.	1035.77 Cu. Yd.<Cut>	Cut	1,036
8	Discovery Parking EG	SSF 012810 Surface	1910.07 Cu. Yd.	18.44 Cu. Yd.	1891.62 Cu. Yd.<Cut>	Cut	1,892
			33,570	**31,584**		**Subtotal**	**1,986**
						TOTAL	**4,689**

Notes:

+ Values in totals represent excess material

APPENDIX - C Snowmaking Reservoir CPE&SC

BELLEAYRE SNOWMAKING POND DAM CONSTRUCTION

Erosion and Sediment Control Plan

March, 2010

New York State
Department of Environmental Conservation
Division of Operations
Bureau of Design and Construction
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Albany, New York, 12233-5252
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P. REFERENCES

Q. ATTACHMENTS

1. Drawing SM15, SM15A, SM15B – Snowmaking Pond Erosion Control Construction Sequence Sheets 1 through 3, drawings SM 16, SM17 – Sediment and Erosion Control Details, are included under separate cover in the plan drawing set.
2. Drawing P-1, Belleayre Snowmaking Pond Watershed
3. Sediment Trap and Rock Dam sizing calculations

A. PROJECT LOCATION AND DESCRIPTION

The New York State Department of Environmental Conservation, Division of Operations, is constructing a new dam at Belleayre Mountain. The project site is located in the Town of Andes, Delaware County at N 42D 08.56' and W 74D 29.90'. This project establishes an impoundment and dam that satisfy New York State Dam Safety criteria for spillway capacity and stability.

This site was surveyed by NYSDEC's Division of Operations and the James M. Sewall Company. All site contours and earthwork calculations are computer-generated from these surveys.

B. EXISTING SITE CONDITIONS

The site for the pond and dam is to the south of the Belleayre Ski Center Maintenance Building. In September 2008, five soil borings were drilled and three test pits were excavated in the pond and embankment area. A geotechnical report from Empire Geo Services, Inc. describes the on-site soils as generally sands and gravels with trace to some amounts of silt to depths of 19 to 24 feet. This is underlain by glacial till down to sandstone bedrock. Bedrock depths generally rose from south to north from 33.5 to 23.8 feet. Most soil samples are classified as SM-GM based on the Unified Soil Classification System. Cobbles and boulders were also noted in the test pit logs. STATSGO soil maps for the pond watershed area show all soils are Vly Group C. Soil for the PMF watershed is 50% Vly Group C and 50% Halcott Group C.

C. PROPOSED SITE CONDITIONS

The principal inflow to the pond arrives from the west via a proposed concrete diversion structure in Crystal Brook. The structure contains a notched weir that allows all flow up to 0.5cfs to continue through the brook, while higher flows can be diverted to the pond if desired. This pass-through flow requirement was determined by Mark Woythal, Leader of the NYSDEC Instream Habitat Protection Unit. A sluice gate mounted to a side vault provides control over whether any of the excess flow is directed towards the pond. To avoid recirculation of water, the outflow from the pond re-enters Crystal Brook downstream of the diversion structure.

The proposed spillway is a fifteen foot long concrete weir. A stone-lined outlet channel conveys the outflow back into Crystal Brook. The proposed dam varies in height from zero to 54 feet above the downstream toe, with upstream and downstream slopes of 2.5H:1V. The crest is at elevation 1929.1 with a width of 11 feet. The normal pool depth varies from 26.5 to 16.5 feet with a normal pool elevation of 1926.5. The impoundment floor slopes from elevation 1910 at its east end down to 1900 at the west limit. The area near the proposed snowmaking piping intake also drops to 1900.

Borrow material for the new dam will be excavated from within the footprint of the new embankment. Stages of embankment in ten-foot increments are identified on the Snowmaking

Pond Erosion Control Construction Sequence drawings. Material will be pushed with scrapers to the intended location and raked to remove stones greater than six inches in diameter. Excavation spoils from the screening operation will be spread downstream of the toe of the new dam while maintaining drainage, then seeded and mulched if they are not gravel size or larger materials. The prepared subgrade will be inspected to ensure stones larger than six inches are removed prior to placement. Any bedrock exposed while excavating near the pump house intake will be monitored and grouted if necessary to reduce the likelihood of water entering any fractures. Should additional embankment material be required to complete the dam, the cross slope of the impoundment floor will be flattened in the middle portion.

No permanent sediment and erosion control measures will be created as part of this project. All measures are temporary and will be installed and removed as outlined in the maintenance plan and the construction sequence below. The finished grade slopes of the new impoundment will be inspected periodically and mowed at least annually as part of the inspection and maintenance plan as required by the NYSDEC Dam Safety section.

D. MAINTENANCE PLAN

1. For construction sites where soil disturbance activities are ongoing, the qualified inspector shall conduct a site inspection at least once every seven calendar days. Where soil disturbance activities are ongoing and greater than five acres of soil are disturbed at any one time, the qualified inspector shall conduct at least two site inspections every seven calendar days. When performing just two inspections every seven calendar days, the inspections shall be separated by a minimum of two full calendar days. Inspections will be conducted jointly by the DEC Inspector and the Contractor. Any needed repairs will be initiated within one business day and completed within seven business days for the duration of the project.

2. Stone at the construction entrance will be cleaned or replaced when it is no longer capable of removing soil from the tires and tracks of construction traffic. The paved access road will be swept as required to minimize dirt and dust present.

3. Sediments will be removed from behind the silt fence when it reaches a depth of about 0.5 ft at the fence. The silt fence will be repaired as necessary to maintain a barrier.

4. Sediment deposited in the temporary sediment traps will be removed once the capacity of the traps is reduced by half. Sediments will be spread on site with other material not suitable for use in the new dam, then seeded and mulched. Sediment traps shall be inspected before and after anticipated rainfall events to ensure adequate storage capacity.

5. Disturbed areas that are completed or anticipated to be inactive for over seven days shall be stabilized and mulched per section 02930 to establish turf.

6. Stabilized construction entrance, silt fence, perimeter dikes and sediment traps will be removed at the completion of construction after final vegetation has reached 80% coverage.

E. CONSTRUCTION SEQUENCE

1. Install stabilized construction entrance and clear and grub trees to the extent required for the installation of the temporary sediment traps and the perimeter dikes.

2. Clear and grub trees around the new spillway structure, outlet channel, drawdown pipe & vault and new water lines in the west pond area. Install structures after preparing the subgrade. Establish turf in areas at finished grade. Construct pea gravel check dams upstream of the new outlet pipe in the location shown on sheet 15A.

3. Clear and grub the area shown in the snapshot for embankment up to elevation 1890. Process and place embankment material as the sediment trap is excavated. Advance the eastern face of the sediment trap as required for embankment material as shown on sheet 15A.

4. Stabilize new embankment slopes with seed and the specified erosion control mats as material is placed. Place seed and mats on the downstream face of the new embankment. Interior slopes above elevation 1904 shall be stabilized in with light seed and mulch as noted on the drawings. Any existing grass below elevation 1926.5 will be killed off when the impoundment fills. Interior slopes above elevation 1926.5 shall be full stabilized and seeded once they are brought to finished grade.

5. After embankment gains elevation, clear and grub the areas as shown on the drawings. Continue embankment construction and excavation of grubbed areas in the central and south eastern pond area as shown on sheets 15A and 15B.

6. Complete excavation and embankment to finished grade for the pond interior. Pea gravel check dams inside the pond shall be maintained until the pond is allowed to be filled. Seed and establish turf on embankment crest immediately after earthwork is complete in a given area.

7. Remove perimeter dikes, sediment traps, check dams, silt fence and construction entrance once the turf has reached the final stabilization 80% coverage criteria.

F. FUELS

Fuel for construction equipment shall either be obtained from a licensed distributor of petroleum products or from an approved above ground storage tank on site. A distributor may be contracted to arrive on site periodically and fill all equipment as necessary. All distributors of petroleum products must have adequate liability insurance to mitigate and clean up any spills that occur on site as well as obtain appropriate permits and licenses from the NYSDEC. All above ground storage tanks with a combined capacity of 1,100 gallons shall be installed pursuant to 6 NYCRR Part 614 Standards for New and Substantially Modified Petroleum Storage Facilities.

Fuel from construction vehicles may come into contact with stormwater when vehicles are stored outside. Good housekeeping and preventative maintenance procedures shall be implemented

to ensure fuel spills and leaks are minimized during refueling and storage. Any small-scale fuel or oil spills must be remedied immediately and contaminated soils shall be disposed of appropriately. The designated spill prevention and response team shall handle large-scale gasoline spills.

Oil and other petroleum products may be stored on site in limited quantities to ensure the continued operation of construction equipment in the event a scheduled delivery is unavailable. Items shall be stored in their original containers within temporary structures and shall not be exposed to stormwater. Used oil and petroleum products shall be stored in approved containers until recycled or disposed of at an approved disposal facility.

G. TEMPORARY FACILITIES

Temporary sanitary facilities may be located on site for construction workers. This facility shall be located in an accessible and visible location. Such a facility shall be leak and tip proof. A waste management company may be contracted to arrive on site and provide the routine pumping and sanitization of the facility. Such a company shall have adequate liability insurance to mitigate and clean up any spills that occur on site as well as appropriate permits and licenses from the NYSDEC.

H. DUST CONTROL

Construction traffic must enter and exit the site at the stabilized construction entrance. The purpose is to trap dust and mud that would otherwise be carried off-site by construction traffic. Water trucks will be used as needed during construction to reduce dust generated on the site. Dust control must be provided by the General Contractor to a degree that is acceptable to NYSDEC, and in compliance with applicable local and state dust control regulations.

I. SOLID WASTE

No solid materials, including building materials, are allowed to be discharged from the site with storm water. All solid waste, including disposable materials incidental to the major construction activities, must be collected and placed in containers. The containers will be emptied periodically by a contract trash disposal service and hauled away from the site.

J. GOOD HOUSEKEEPING

Good housekeeping is essential to reducing the risk of contaminating runoff waters during every stage of construction. The General Contractor shall ensure supervisors train each employee in good housekeeping practices as they pertain to the implementation of this SWPPP.

K. PREVENTATIVE MAINTENANCE

All on-site vehicles must be inspected regularly for oil and grease leaks. All leaks shall be repaired immediately upon obtaining the appropriate equipment. If the leak cannot be fixed immediately, it shall be temporarily mitigated to prevent the flow of contaminants onto the soil and potentially into the stormwater. If necessary, the reservoir will be drained to stop the flow of contaminants or the vehicle will be moved under cover. Drip pans shall be used when performing any maintenance or cleaning on construction vehicles.

L. SPILL PREVENTION AND RESPONSE

The safety of employees and neighbors shall be of utmost concern when hazardous or toxic chemicals are stored or utilized on-site. Materials Safety Data Sheets (MSDS) shall be obtained for all toxic or hazardous substances that are stored on-site to provide employees with a valuable database in assessing risk in the event of a spill.

Any above ground storage tanks on site shall be installed pursuant to 6 NYCRR Part 614. According to the New York State "Minimum Standards for New and Substantially Modified Above Ground Storage Facilities", all tanks installed must meet or exceed the design criteria in one or more of the following design or manufacturing standards: UL No. 142, UL No. 58, API Standard No. 650, API Standard No. 620, CAN4-S601-M84 or CAN4-S630-M84. Tanks constructed of wood, concrete, aluminum, fiberglass reinforced plastic as well as riveted or bolted steel tanks are not permitted. All tanks must have installed leak detection systems, secondary containment, corrosion protection, and undergo periodic monitoring pursuant to all Part 614 requirements.

Should a spill occur, trained individuals shall be on-call at all times to mitigate the potential negative effects of a spill. The General Contractor shall have trained employees knowledgeable in the location of sorbent, brooms, rags and mops in the event of a small-scale spill. If the General Contractor does not have Hazardous Materials trained employees on site, a firm that specializes in handling spills, soil and water contamination shall be called.

After a spill occurs, all personnel not trained in hazardous materials spill response shall be asked to evacuate the immediate area. The New York State NYSDEC of Environmental Conservation (NYSDEC) Spill Response Team shall be called to investigate the spill and determine if additional actions should be taken to ensure the safety of personnel and nearby residents. Should any employee have a suspected injury, a local emergency squad must be contacted immediately.

M. CONSTRUCTION MATERIAL STORAGE

The following construction materials can be expected to be stored on site at an upland location: drainage pipe, geosynthetic fabric, light and heavy stone, #1 and #3 stone, select gravel, excavated material, embankment material, and topsoil. It is the contractor's

responsibility to assure that the construction materials are stored properly in accordance with the locations and details shown on the site plan.

N. DISPOSAL OF SURPLUS EARTHWORK MATERIALS

The location of the disposal site for excavated materials is the adjacent field west of the existing dam. This will consist of stone and earth spoil from the existing dam as well as material excavated from the emergency spillway that is not suitable for use as embankment for the new dam. Concrete and steel from the existing dam will be disposed off site in an approved facility in Elka Park.

O. MAINTENANCE OF EROSION AND SEDIMENT CONTROL PRACTICES

All temporary erosion control measures will be in place before construction resumes. Such measures will be effectively maintained and will not be removed until the disturbed areas are acceptably stabilized. The contractor is responsible for the implementation and maintenance of all erosion control measures as shown in this SWPPP. Inspections will be jointly conducted by the contractor and inspector at least twice every seven days and within 24 hours of the end of a storm in which precipitation is 0.5 inches or greater. Deficiencies, if found, will be corrected within 48 hours.

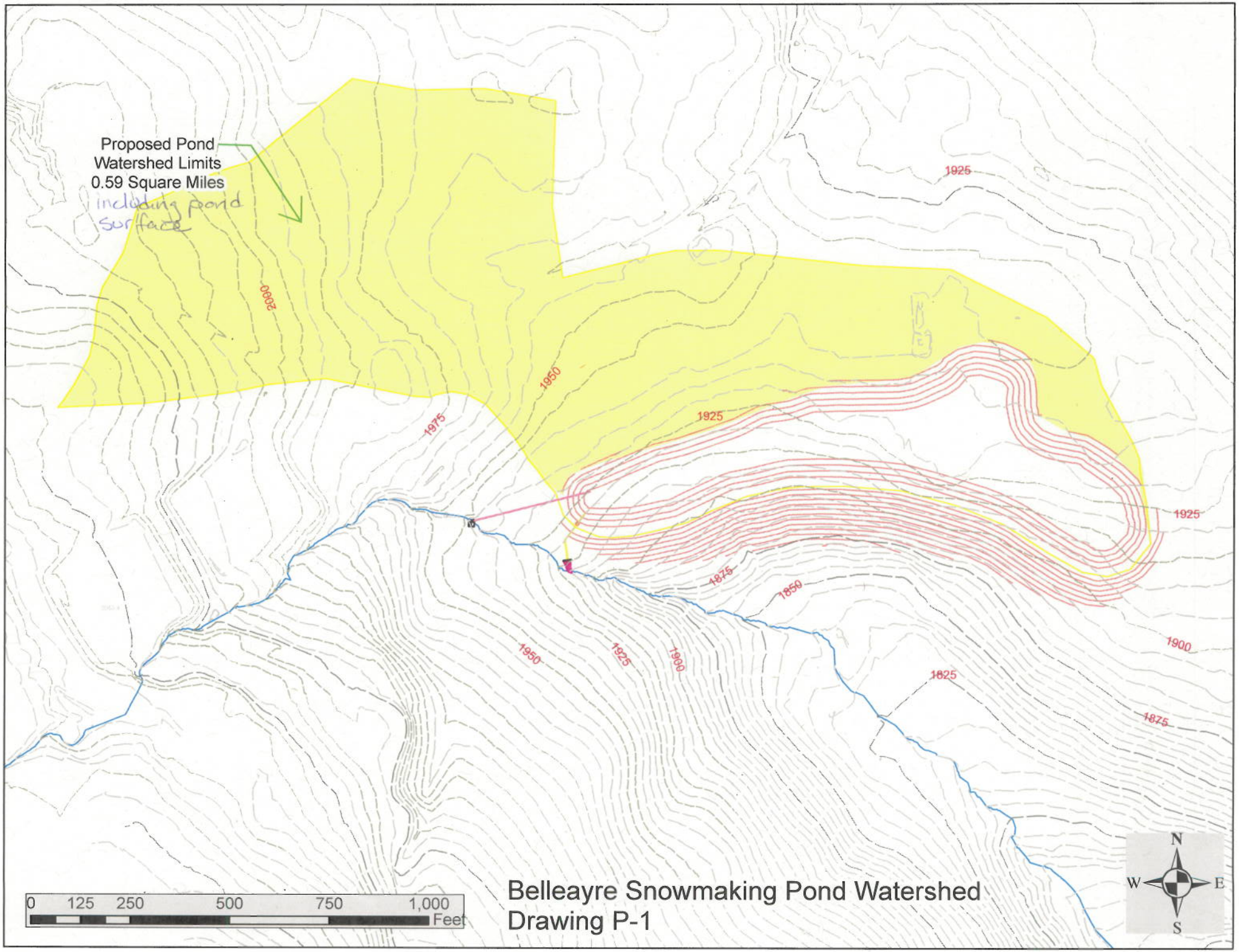
The long term maintenance of this site will be undertaken by DEC Division of Operations and the maintenance procedures will be addressed in an Operations & Maintenance Manuel (O&M Manual) which will be created for this site. The O&M Manual is a compilation of site specific as built drawings, specifications and catalog cuts and maintenance procedures.

Annual Checks and after Major Storms:

- Upstream and downstream stone protection area shall be inspected and new stone added as necessary.
- The grass-lined emergency spillway and dam embankment shall be mowed once a year to prevent the growth of trees.
- The drawdown gate shall be briefly opened fully and then closed to confirm it functions as intended.

P. REFERENCES

1. "New York State Standards and Specifications for Erosion and Sediment Control," NYSDEC (August 2005).
2. "SPDES General Permit for Stormwater Discharges," NYSDEC (April 2008)
3. "NYSDEC Stormwater Management Design Manual," NYSDEC (April 2008)
4. "Construction Site Erosion and Sediment Controls, Planning, Design and Performance" Robert Pitt, Shirley Clark, Donald Lake (2007)



Belleayre Snowmaking Pond Watershed
Drawing P-1

Pea Gravel: Comply with DOT Article 703-02 for screened gravel, size 1A.
Belleayre Snowmaking Pond

Sieve Size	Size opening (mm)	Percent Passing
1/2 inch	12.7	100
1/4 inch	6.35	90-100
1/8 inch	3.17	0-15
No. 200	0.075	0-1

Depth behind check dam, ft	
Width of check dam perp. to flow, ft	W
Horizontal flow through check dam, ft	L
Average rock dia., ft	D
Flow through check dam, cfs	Q

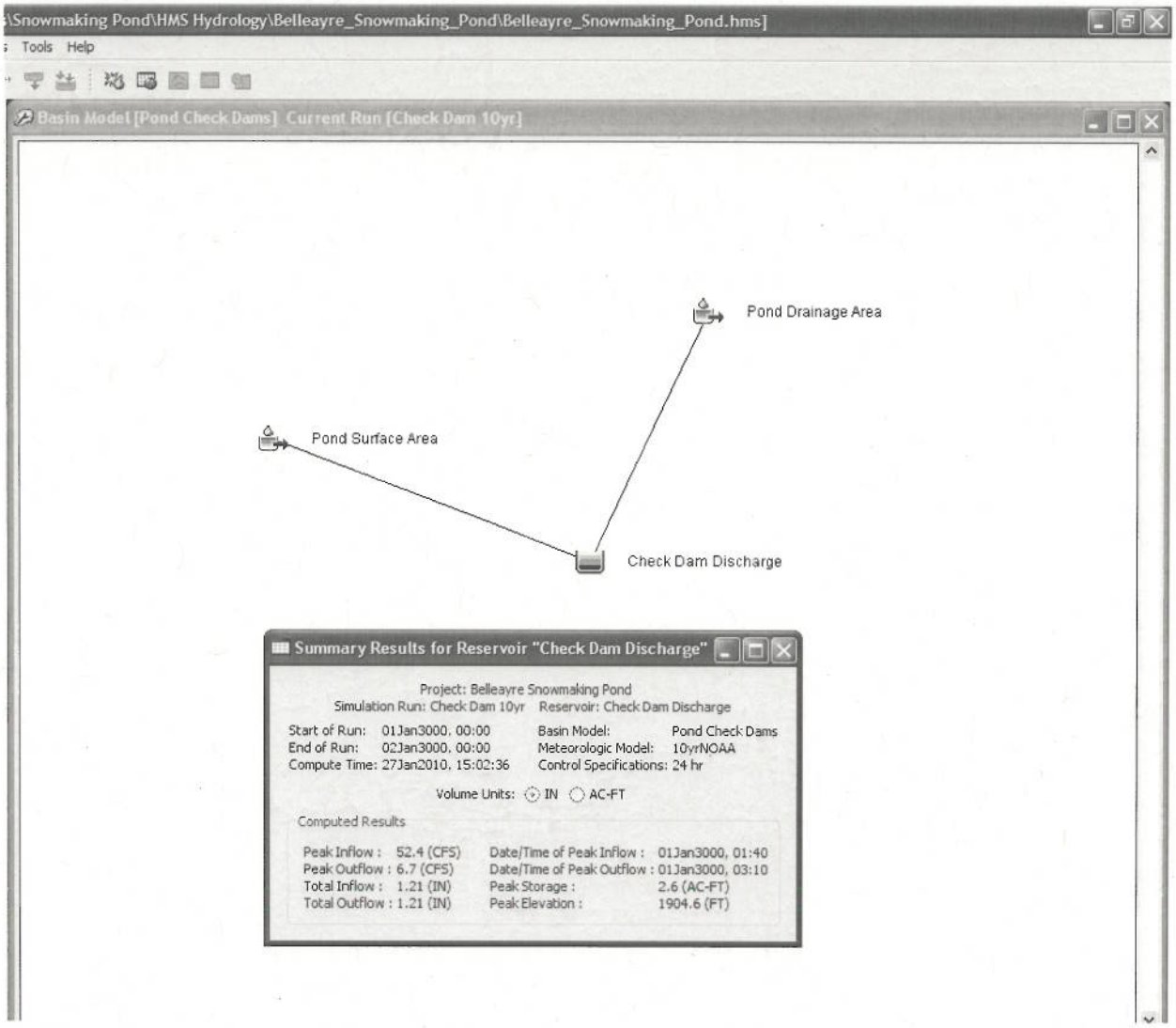
Taken from 'Construction Site Erosion and Sediment Controls' pages 261-262
by Robert Pitt, Shirley Clark and Donald Lake

Flow through rock dam

	W	L	D	Q
ft	ft	ft	ft	cfs
0	25	3	0.03125	0.00
0.25	25	3	0.03125	0.96
0.5	25	3	0.03125	1.52
0.75	25	3	0.03125	1.99
1	25	3	0.03125	2.41
1.25	25	3	0.03125	2.80
1.5	25	3	0.03125	3.16
1.75	25	3	0.03125	3.50
2	25	3	0.03125	3.83
2.25	25	3	0.03125	4.14
2.5	25	3	0.03125	4.44
2.75	25	3	0.03125	4.73
3	25	3	0.03125	5.02
3.25	25	3	0.03125	5.29
3.5	25	3	0.03125	5.56
3.75	25	3	0.03125	5.82
4	25	3	0.03125	6.08
4.25	25	3	0.03125	6.33
4.5	25	3	0.03125	6.57
4.75	25	3	0.03125	6.81
5	25	3	0.03125	7.05
5.25	25	3	0.03125	7.28
5.5	25	3	0.03125	7.51
5.75	25	3	0.03125	7.74
6	25	3	0.03125	7.96

NYSDEC Blue Book Design Specifications for Rock Dams

Blue Book Requirements	Provided Dimensions/Areas/Volumes
Max Height = 6'	Actual height of checkdam = 5'
Min detention time = 8 hours	Actual detention time = 12 hours
.01 acres per cfs of inflow	53 cfs peak 10yr inflow, 1.5AC surface area at EL 1905
3600cf/acre of drainage	39 acres of drainage area, 3.25 Ac-ft storage = 3630cf/Ac
1 foot of freeboard min	Actual freeboard is over 20 feet using the pond area


\Snowmaking Pond\HMS Hydrology\Belleayre_Snowmaking_Pond\Belleayre_Snowmaking_Pond.hms]
Tools Help
Basin Model [Pond Check Dams] Current Run [Check Dam 10yr]
Pond Drainage Area
Pond Surface Area
Check Dam Discharge
Summary Results for Reservoir "Check Dam Discharge"
Project: Belleayre Snowmaking Pond
Simulation Run: Check Dam 10yr Reservoir: Check Dam Discharge
Start of Run: 01Jan3000, 00:00
End of Run: 02Jan3000, 00:00
Compute Time: 27Jan2010, 15:02:36
Basin Model: Pond Check Dams
Meteorologic Model: 10yrNOAA
Control Specifications: 24 hr
Volume Units: IN AC-FT
Computed Results
Peak Inflow : 52.4 (CFS)
Peak Outflow : 6.7 (CFS)
Total Inflow : 1.21 (IN)
Total Outflow : 1.21 (IN)
Date/Time of Peak Inflow : 01Jan3000, 01:40
Date/Time of Peak Outflow : 01Jan3000, 03:10
Peak Storage : 2.6 (AC-FT)
Peak Elevation : 1904.6 (FT)

Published 2.007

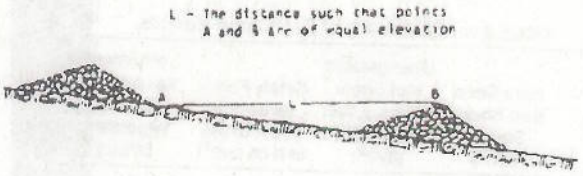


Figure 5.19. Spacing of typical rock check dams (USDA 2003).

- Maximum Height:
  —2 feet when drainage area is less than 5 acres
  —3 feet when drainage area is 5 to 10 acres
- Depth of Flow:
  —6 inches when drainage area is less than 5 acres
  —12 inches when drainage area is 5 to 10 acres
- Side Slopes:
  —2:1 or flatter
- Max. Spacing between dams:
  —Elevation of toe of upstream dam is at or below elevation of crest of downstream dam.

Top of dam, perpendicular to flow, should be parabolic. The center of the dam must be lower than the ends. The dam shall be constructed well into the abutment so that water cannot run around the dam.

Rock check dams should be constructed of durable rock riprap. Riprap gradation shall conform to the requirements of Class I Riprap, Alabama Highway Department, *Standard Specification for Highway Construction*, or equivalent.

Maintenance

Check dams may be removed when their useful life has been completed. Whenever check dams are removed, care shall be taken to minimize disturbance to the remainder of the watercourse.

The area where check dams are removed shall be shaped and smoothed to water course dimensions and seeded and mulched immediately. On rock check dams, care shall be taken to remove all rock if the area is to be mowed.

Periodic inspection is necessary on check dams. Repair

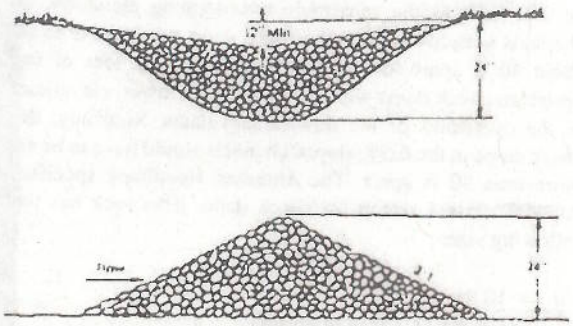
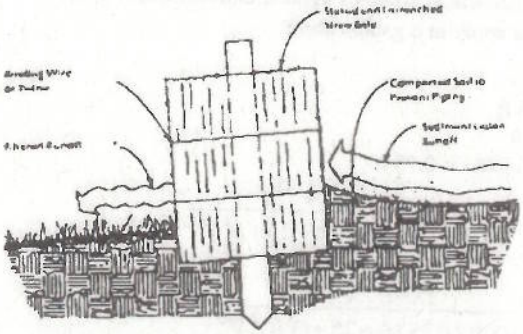


Figure 5.20. Cross sections of rock check dam (USDA 2003)

PROPER PLACEMENT OF STRAW BALE BARRIER IN DRAINAGE WAY



CROSS-SECTION OF A PROPERLY INSTALLED STRAW BALE

Figure 5.21. Typical hay bale check dam (USDA 2003)

should be done as soon as need is noted to minimize damage and expense of repair."

Flow Rates through Rock Check Dams

The flow through a rock check dam can be calculated using the following equation:

$$Q = \frac{h^{2/3} W}{\{(L/D) + 2.5 + L^2\}^{0.5}}$$

where,

Q = Outflow through the rock check dam (cfs)
h = Ponding depth behind the check dam (ft)
W = Width of the check dam (ft), not to be confused with the horizontal flow path length through the check dam
L = Horizontal flow path length through the check dam (ft)
D = Average rock diameter in the check dam (ft)

This equation is from *Analysis of Flow through Porous Media as Applied to Gabion Dams Regarding the Storage and Release of Storm Water Runoff*. NAHB/NRC Designated Housing Research Center at Penn State, Report No. 10, August 1992. This equation was developed to calculate the flow through a gabion dam, which is usually a vertical walled structure composed of large stones confined in wire baskets. In order to apply it to rock check dams that have sloped faces, WinDETPOND (www.WinSLAMM.com), a continuous hydraulic and particle routing model, calculates the flow by dividing the rock check dam into

horizontal slices. The flow through each slice is calculated and then the flows from all slices are summed to determine the total flow for a given depth.

Example: Calculation of Flows through Check Dams

The following examples assume uniform thickness (such as would apply in a gabion dam):

$h = 3$ ft
$W = 15$ ft
$L = 3$ ft
$D = 9$ inches $= 0.75$ ft

$$Q = \frac{h^{2/3}W}{[(L/D) + 2.5 + L^2]^{0.5}}$$

$$= \frac{(3\text{ ft})^{2/3}(15\text{ ft})}{[(3\text{ ft}/0.75\text{ ft}) + 2.5 + (3\text{ ft})^2]^{0.5}} = 7.9\text{ ft}^3/\text{sec}$$

The same rock check dam, but with only a 1 ft depth of water:

$h = 1$ ft
$W = 15$ ft
$L = 3$ ft
$D = 9$ inches $= 0.75$ ft

$$Q = \frac{h^{2/3}W}{[(L/D) + 2.5 + L^2]^{0.5}}$$

$$= \frac{(1\text{ ft})^{2/3}(15\text{ ft})}{[(3\text{ ft}/0.75\text{ ft}) + 2.5 + (3\text{ ft})^2]^{0.5}} = 3.8\text{ ft}^3/\text{sec}$$

This process can be repeated for an installation for different depths of water to create a stage-discharge curve for a rock check dam.

Example: Design for Reinforced Grass-Lined Channels with Check Dams and Level Spreader Pads

A new industrial site in Huntsville, AL, has several 2-acre individual building sites. Each of the sites will be served with a grass-lined channel that will carry site water to a larger swale system. The slopes of the channels vary from about 1 to 6.5%. The calculated peak flow from each construction site was calculated to be 16 ft³/sec (corresponding to the Huntsville, AL, 25-yr design storm of 6.3 inches for 24 hours). A grass-lined channel is to be designed for each site. The bare seed bed is assumed to have a hydraulic roughness of about 0.016. The channels are to be built to be 10 ft wide on the bottom and have 3 to 1 (h:v) side slopes. Table 5.20 summarizes the results of these calculations.

TABLE 5.20. Summary of Calculated Results.

Slope	Bare Seed Bed Shear Stress (lb/ft²)	Unvegetated Mat Shear Stress, Effect on Soil (lb/ft²)	Safety Factor (allowable shear stress of 0.05 lb/ft²)	Maximum Velocity w Mature Vegetatio (ft/sec)
1%	0.14	0.012	4.2	3.1
3%	0.28	0.023	2.2	4.8
5%	0.42	0.035	1.4	5.5
6.5%	0.46	0.039	1.3	6.4

The seed bed has an allowable shear stress of about 0 lb/ft². The calculated values for unprotected conditions all much larger. These values would be exceeded even wi much smaller 2-yr design storm (3.9 inches, 24 h Therefore, an erosion control mat is needed to protect seedbed until the grass can become established. A No American Green S75 mat was selected, having an allowa shear stress of 1.55 lb/ft² and a life of 12 months. T unvegetated mat has a roughness factor n of 0.055. The sh stress under the mat is calculated as follows (for the 6. slope condition), assuming a $C_f = 0$ for the unveget condition and a bare soil n of about 0.016.

$$\tau_r = 0.46(1-0)\left(\frac{0.016}{0.055}\right)^2 = 0.039\,ft^2/\text{sec}$$

The unvegetated mat is seen to be suitable protection the seed bed, with safety factors ranging from 4.2 (for the 1 slopes) to 1.3 (for the 6.5% slopes).

The allowable velocity for mature bermudagrass f slopes <5% is 6 ft/sec for sandy silt soils to 8 ft/sec for sil clay soils. The 6-ft/sec maximum is expected to be mo applicable for the site soils. The swales greater than 5 slopes may be a problem, as they exceed the maximum slop criterion for bermudagrass. In addition, the 6.5% slopes ha maximum velocities of about 6.4 ft/sec, slightly greater th the maximum permissible velocity. Although the maximum flows are very infrequent (associated with th 25 year storms), rock check dams were specified for the and 6.5% slopes to provide a suitable safety factor.

The check dams, in the 3-ft deep channels, are assumed be 2 ft high to the maximum over topping elevation. channels with 5% slopes, the check dams would have to b about 40 ft apart (or less) to ensure that the toes of th upstream check dams were at the same, or lower, elevation as the overflows of the downstream dams. Similarly, th check dams in the 6.5% sloped channels would have to be n more than 30 ft apart. The *Alabama Handbook* specifie ALDOT class 1 riprap for check dams. This rock has th following size:

$d_{10} = 10$ lbs
$d_{100} = 100$ lbs (1.1 ft in diameter)
$d_{50} = 50$ lbs (0.8 ft in diameter)

Belleayre Snowmaking Pond
Sediment trap drainage areas and sizing

Temporary Sediment Trap Sizes						
	Drainage Area (Acres)	Width (ft)	Length (ft)	Depth (ft)	Volume (ft^3)	Required Volume @ 3600 ft^3/Ac
West Basin	1	18	70	3	5085	3600
Middle Basin	1.25	20	80	3	6272	4500
East Basin	1.33	20	80	3	6272	4788

Volume calculations are done using the average top and bottom area of the basin multiplied by the depth of the basin. Sideslopes are conservatively assumed to be 1.5H:1V instead of 2H:1V. The basin floor dimensions are given on the Construction Sequence Drawing SM 15A.

APPENDIX - D TR-55 Construction Phase Estimated Peak Flow Analysis

TR-55 Peak Discharge Calculations

Upper Discovery Parking Area

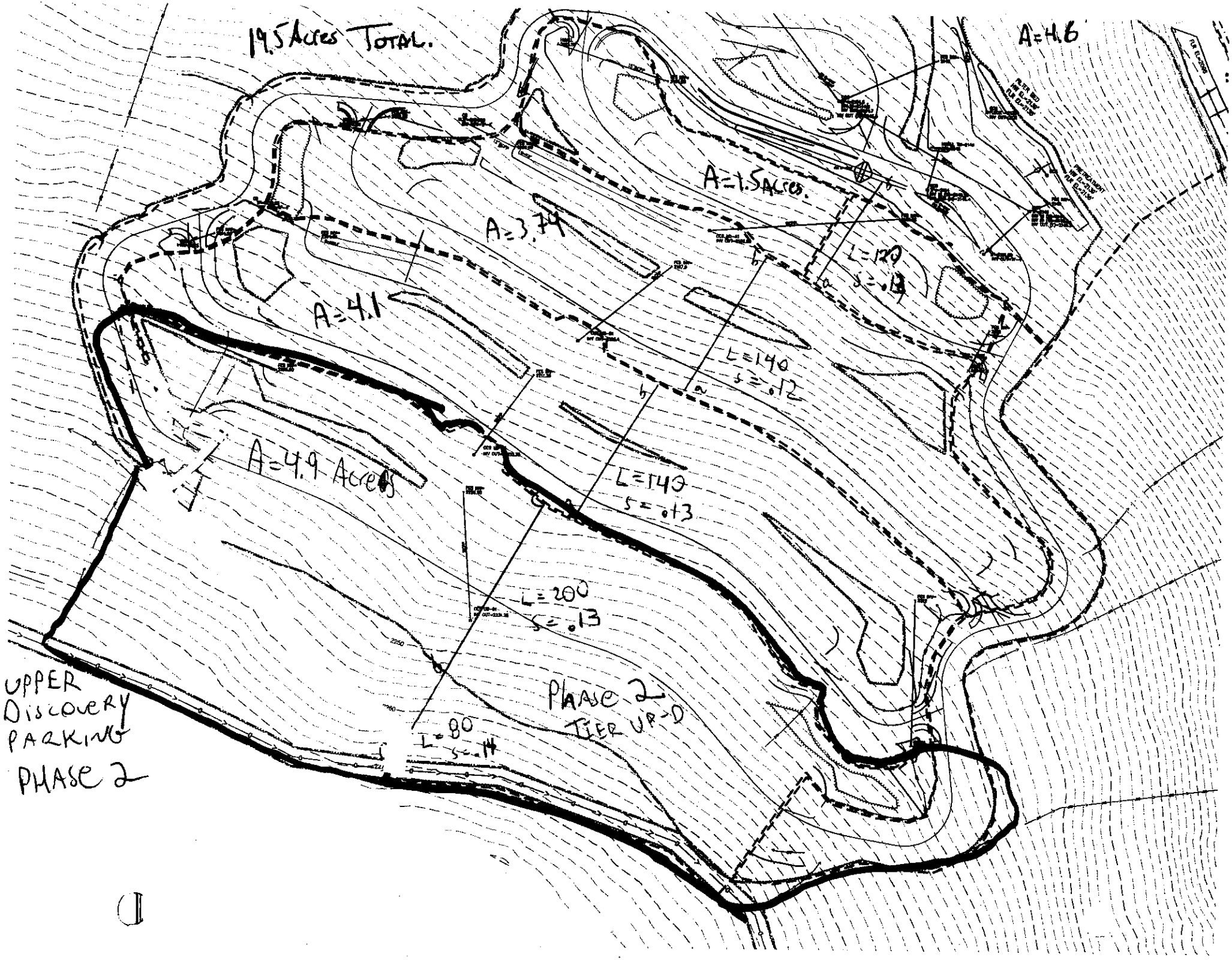

19.5 Acres Total.
A=4.6
A=1.5 Acres.
A=3.79
A=4.1
A=4.9 Acres
L=120
S=.13
L=140
S=.12
L=140
S=.13
L=200
S=.13
L=80
S=.14
Phase 2
Tier up-D
UPPER
Discovery
PARKING
PHASE 2

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Phase 2

Project Bellayre Upper Discovery By Jm Date 1/29/10

Location Upper Tier D West Swale Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Open	90			1.2	108
C	Wooded	70			1.6	112
					Totals = 2.8	220

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{220}{2.8} = 78.5$ Use CN = 79

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6"	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	3.68	1.57	

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Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellevue Upper Discovery By JM Date 1/29/09

Location Tier D Phase 2 Checked ____ Date ____

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☐ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.2A	91			2.1	191
C	Wooded Good 10.2C	70			3.3	231
					Totals =	5.4 422

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{422}{5.4} = 78.1$ Use CN = 79

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	3.68	1.57	

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Phase 2

Project Bellmore Upper Discovery By JM Date 1/29/10

Location Upper Tier D, West Swale Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID	ab		
1. Surface description (table 10.3).....			Wooded		
2. Manning's roughness coeff., n (table 10.3).			.4		
3. Flow length, L (total L ≤ 150 ft)	ft		160		
4. Two-yr 24-hr rainfall, P_2	in		4		
5. Land slope, s	ft/ft		.13		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr		.22	+	- .22

Shallow concentrated flow		Segment ID	bc	cd	
7. Surface description (paved or unpaved)			UP	UP	
8. Flow length, L	ft		140	40	
9. Watercourse slope, s	ft/ft		.14	.14	
10. Average velocity, V (figure 10.10).....	ft/s		6	6	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		.007	+ .0018	- .009

Channel flow		Segment ID			
12. Cross sectional flow area, a	ft^2				
13. Wetted perimeter, P_w	ft				
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft				
15. Channel slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s				
18. Flow length, L	ft				
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr			+	-

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr .23

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Phase 2

Project Belleayre Upper Discovery By JM Date 1/29/10

Location Upper Tier D West Swale Checked ____ Date ____

Circle one: Present Developed

1. Data:

5.4 Ace.

Drainage area ..... A_m = ____ mi^2 (acres/640)

Runoff curve number .... CN = 79 (From worksheet 2)

Time of concentration .. T_c = .23 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6"	3.5"	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.532	.532	
5. Compute I_a/P		.088	.15	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	725	725	
7. Runoff, Q ..... (From worksheet 2)	in	3.7	1.6	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	22.6	5.0	

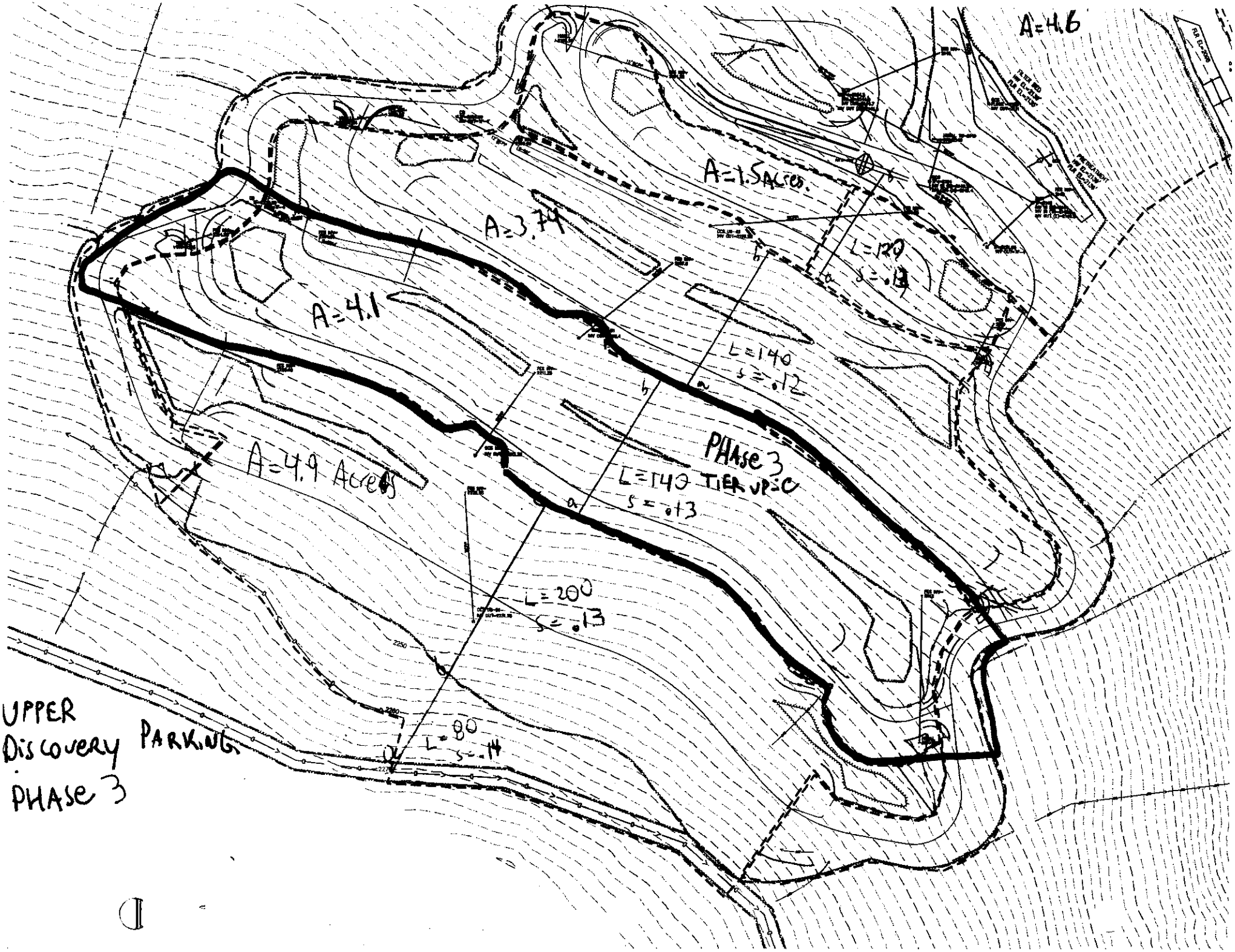

A=4.6
A=1.5 Acres
A=3.79
A=4.1
A=4.9 Acres
L=120
S=.13
L=140
S=.12
PHASE 3
L=140 TIER UP=C
S=.13
L=200
S=.13
L=80
S=.14
UPPER
Discovery PARKING
PHASE 3

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

PHASE 3

Project Belleayre Upper Discovery By JM Date 1/29/10

Location Upper Tier C West Swale Checked ____ Date ____

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☐ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 75%	91			3.0	273
C	Wooded Good 25%	70			.8	56
					Totals =	3.8 329

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{329}{3.8} = 86.5$ Use CN = 87

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in	4.52	1.79	

(Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre Upper Discovery By JM Date 1/29/10

Location Tier 1 Phase 3 Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)	Segment ID	ab	bc	
1. Surface description (table 10.3).....		open	Wood	
2. Manning's roughness coeff., n (table 10.3).		.011	.4	
3. Flow length, L (total L ≤ 150 ft)	ft	120	50	
4. Two-yr 24-hr rainfall, P_2	in	4	4	
5. Land slope, s	ft/ft	.14	.14	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr	.01 +	.09 =	.10

Shallow concentrated flow	Segment ID			
7. Surface description (paved or unpaved)				
8. Flow length, L	ft			
9. Watercourse slope, s	ft/ft			
10. Average velocity, V (figure 10.10).....	ft/s			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	+	=	

Channel flow	Segment ID			
12. Cross sectional flow area, a	ft^2			
13. Wetted perimeter, P_w	ft			
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s			
18. Flow length, L	ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	+	=	.10
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr			

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Bellemyre Upper Discovery By JM Date 1/29/10
Location Tier C Phase 3 Checked ____ Date ____
Circle one: Present Developed

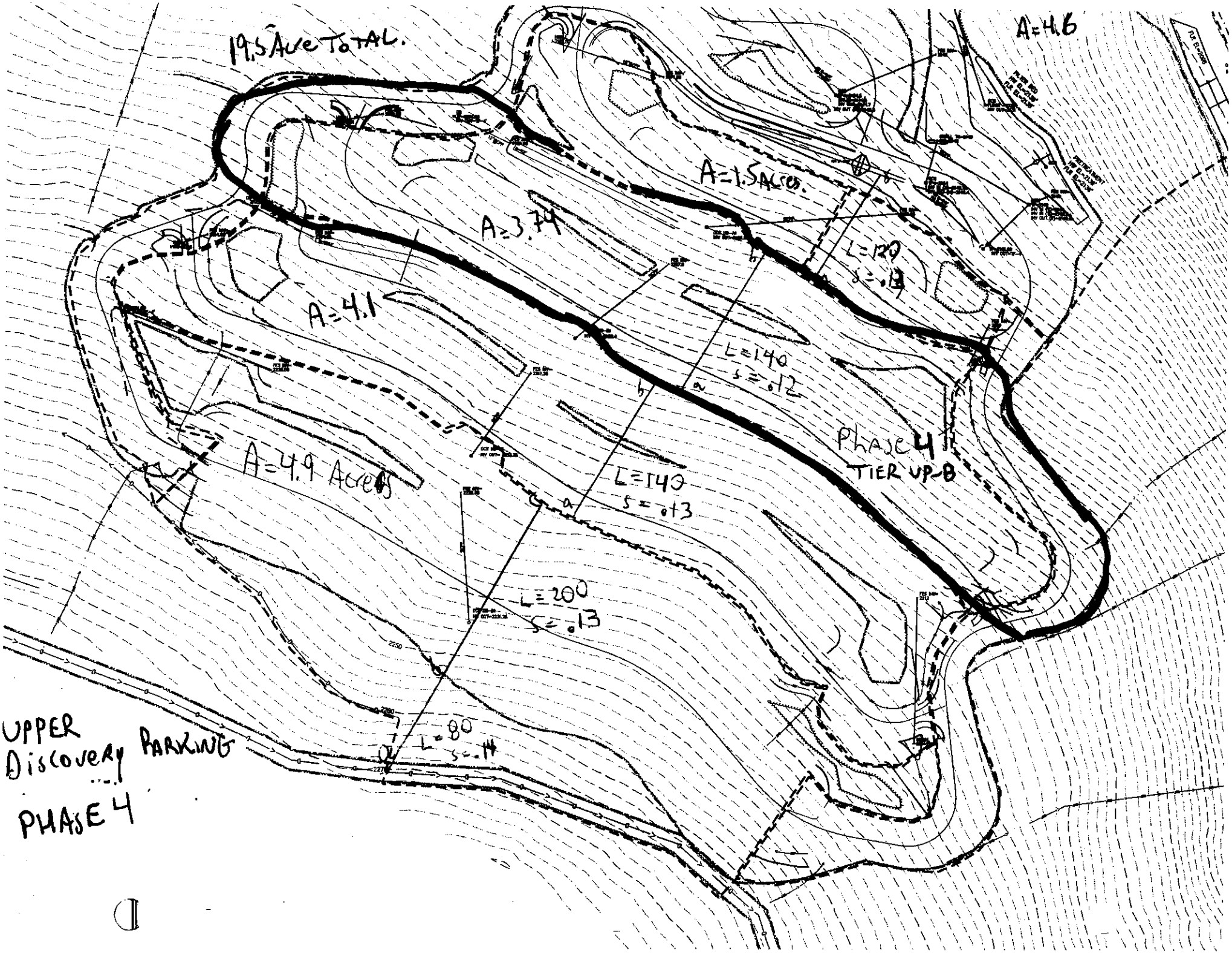
1. Data:

Drainage area ..... A_m = 3.8 mi^2 (acres/640)
Runoff curve number .... CN = 87 (From worksheet 2)
Time of concentration .. T_c = .10 hr (From worksheet 3)
Rainfall distribution type = II (I, IA, II, III)
Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6"	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.299	.299	
5. Compute I_a/P		.05	.085	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	4.52	1.79	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	76.8		

Post Const. 1.19 CFS

28


19.5 Ave Total.
A=4.6
A=1.5 Acres.
A=3.79
A=4.1
A=4.9 Acres
L=120
S=.13
L=140
S=.12
L=140
S=.13
L=200
S=.13
L=80
S=.14
Phase 4
TIER UP-B
UPPER
Discovery PARKING
PHASE 4

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre By JM Date 1/30/10

Location Upper Tier B Phase 4 Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.24	91			2.9	264
C	Wooded Good. 10.2C	70			.8	56
				Totals =	3.7	

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{320}{3.7} = 86.5$; Use CN = 87

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	4.52	1.79	

rev

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre Upper. By JM Date 1/30/10

Location Upper Tier B Phase 4 Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID	AB	BC	
1. Surface description (table 10.3).....			Open	Wooded	
2. Manning's roughness coeff., n (table 10.3).			.011	.4	
3. Flow length, L (total L ≤ 150 ft)		ft	130	60	
4. Two-yr 24-hr rainfall, P_2		in	4	4	
5. Land slope, s		ft/ft	.12	.12	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$	Compute T_t	hr	.011 +	.104 =	.12

Shallow concentrated flow		Segment ID			
7. Surface description (paved or unpaved)					
8. Flow length, L		ft			
9. Watercourse slope, s		ft/ft			
10. Average velocity, V (figure 10.10).....		ft/s			
11. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	+	=	0

Channel flow		Segment ID			
12. Cross sectional flow area, a		ft^2			
13. Wetted perimeter, p_w		ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$	Compute r	ft			
15. Channel slope, s		ft/ft			
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$	Compute V	ft/s			
18. Flow length, L		ft			
19. $T_t = \frac{L}{3600\ V}$	Compute T_t	hr	+	=	0

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr .12

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre Upper By Jm Date 1/20/10

Location Upper Tier B Phase 4 Checked ____ Date ____

Circle one: Present Developed

1. Data:

Drainage area ..... A_m = .00578 (3.7 Acre) mi^2 (acres/640)

Runoff curve number .... CN = 87 (From worksheet 2)

Time of concentration .. T_c = .12 hr (From worksheet 3)

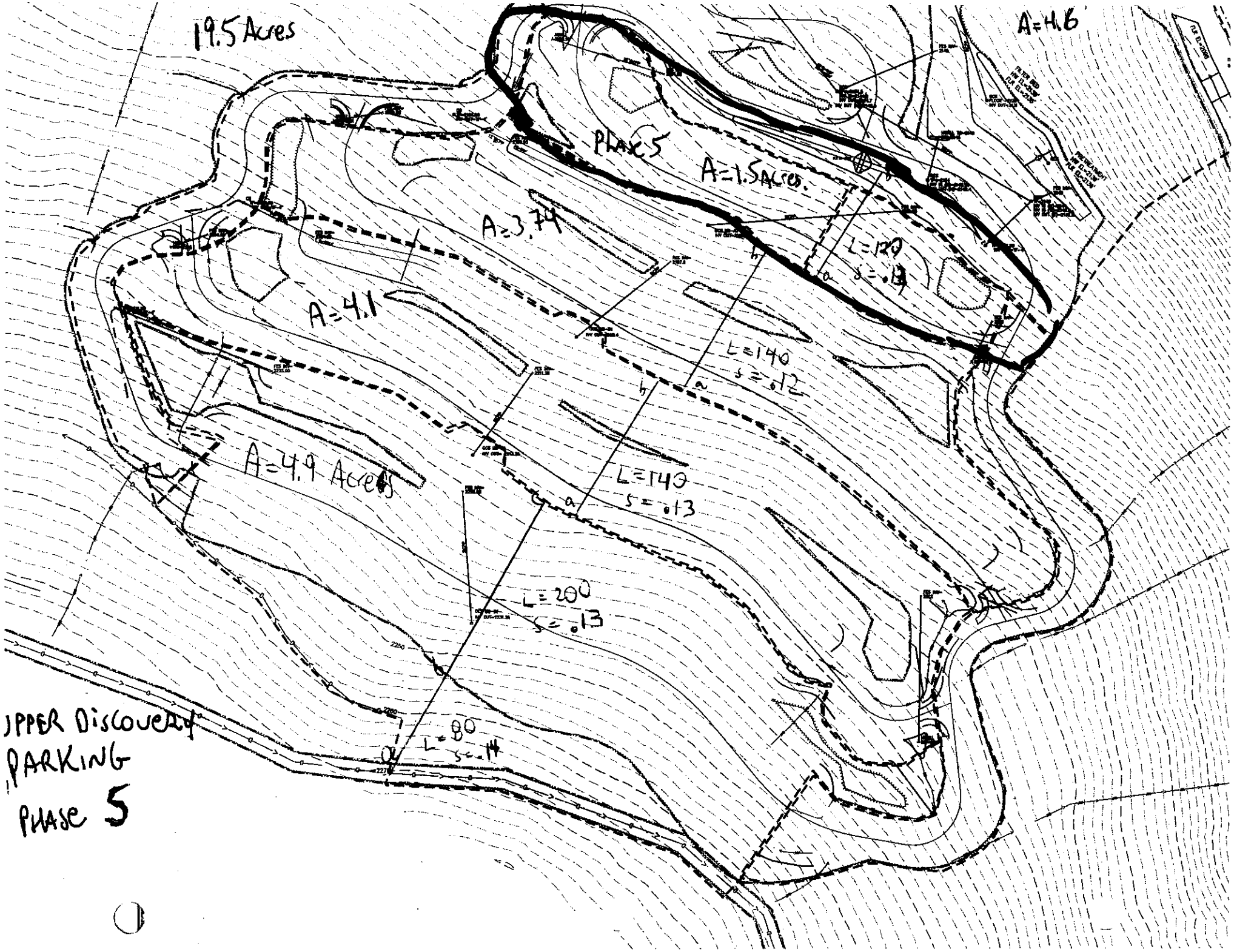
Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.299	.299	
5. Compute I_a/P		.050	.085	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	960	960	
7. Runoff, Q ..... (From worksheet 2).	in	4.52	1.79	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	25.1	9.9	

+2.51 C+D Post Const Flow

27.6 CFS.


19.5 Acres
A=4.6
PHASE 5
A=1.5 Acres.
A=3.79
A=4.1
A=4.9 Acres
L=120
s=.13
L=140
s=.12
L=140
s=.13
L=200
s=.13
L=80
s=.14
UPPER DISCOVERY
PARKING
PHASE 5

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Upper Discovery Parking By JM Date 8/27/09

Location UPA TIER - PHASE 5 Checked ____ Date ____

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☐ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.24	91			1.5	
	Totals =					

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = ____ = ____; Use CN = 91

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10		
Rainfall, P (24-hour) ..... in	6		
Runoff, Q ..... in	5		

(Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Phase 5

Project Upper Discovery Packing. By JM Date 3/27/09

Location TIER UPA PHASE 5 Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)	Segment ID	ab	
1. Surface description (table 10.3).....		SMOOTH	
2. Manning's roughness coeff., n (table 10.3).		.011	
3. Flow length, L (total L $\leq$ 150 ft)	ft	120	
4. Two-yr 24-hr rainfall, P_2	in	4	
5. Land slope, s	ft/ft	.13	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr	.01 +	= .01

Shallow concentrated flow	Segment ID		
7. Surface description (paved or unpaved)			
8. Flow length, L	ft		
9. Watercourse slope, s	ft/ft		
10. Average velocity, V (figure 10.10).....	ft/s		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	+	=

Channel flow	Segment ID		
12. Cross sectional flow area, a	ft^2		
13. Wetted perimeter, P_w	ft		
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft		
15. Channel slope, s	ft/ft		
16. Manning's roughness coeff., n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s		
18. Flow length, L	ft		
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr	+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr		.01

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Upper Discovery Parking By JM Date 8/27/09

Location UPA TIER, PHASE 5 Checked ____ Date ____

Circle one: (Present) Developed

1. Data:

Drainage area ..... A_m = .00234 mi^2 (acres/640)

Runoff curve number .... CN = 91 (From worksheet 2)

Time of concentration .. T_c = .01 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

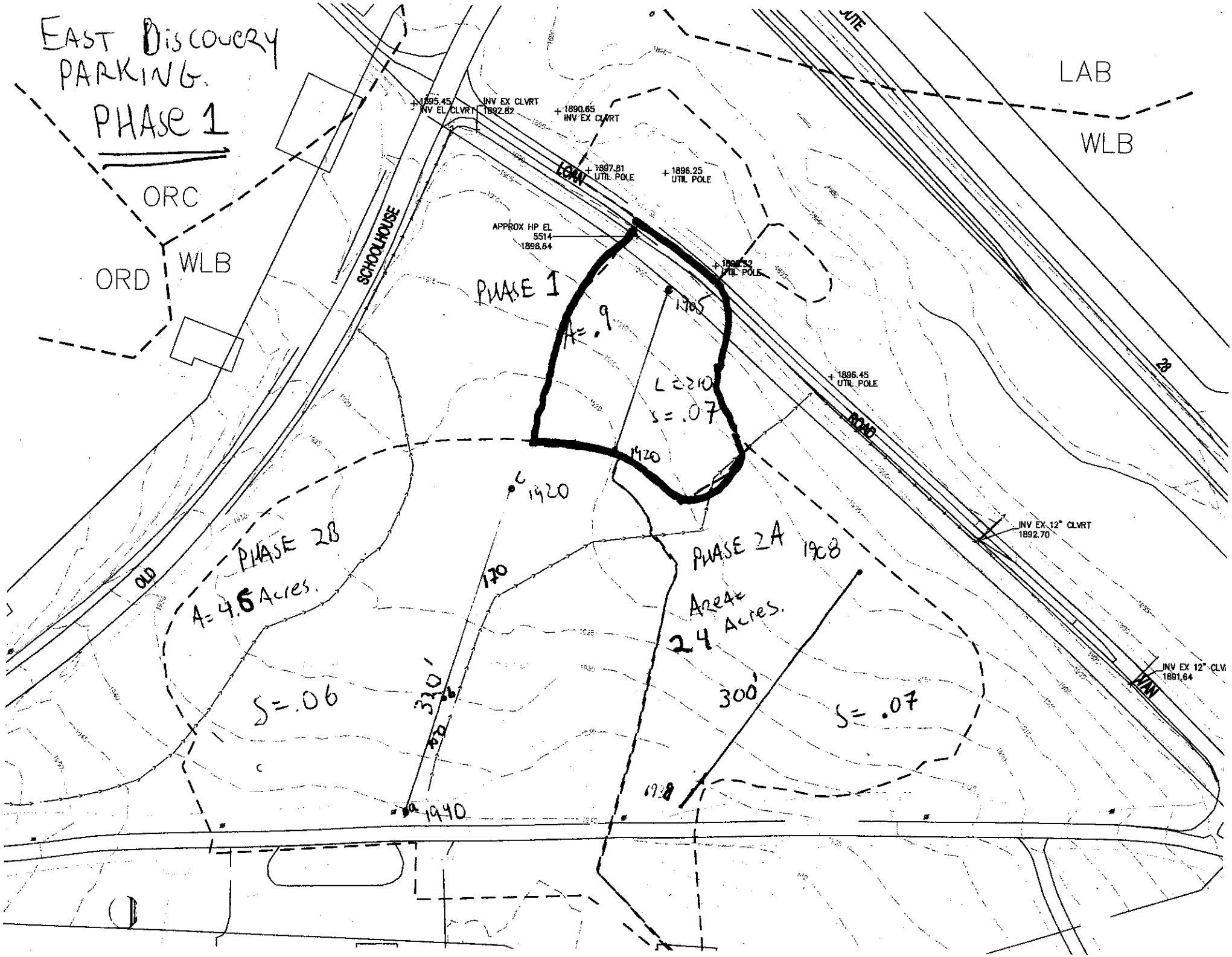
Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.198	.198	
5. Compute I_a/P		.033	.055	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	5	2.55	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	11.7	5.9	

Post Const. Q: B, C, D = 3.89

TR-55 Peak Discharge Calculations

East Parking Area


EAST DISCOVERY PARKING.
PHASE 1
ORC
ORD
WLB
LAB
WLB
SCHOOLHOUSE
ROAD
OLD
ROAD
LOAN
ROAD
1895.45 INV EL CLVRT
INV EX CLVRT 1892.82
1890.65 INV EX CLVRT
1897.81 UTIL POLE
1896.25 UTIL POLE
APPROX HP EL 5514 1898.64
1896.45 UTIL POLE
INV EX 12" CLVRT 1892.70
INV EX 12" CLVRT 1891.64
PHASE 1
A=.9
1765
L=210
S=.07
1920
1920
PHASE 2B
A=4.6 Acres.
170
330'
S=.06
1940
PHASE 2A
1908
Area 2.4 Acres.
300'
S=.07
1918

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre Phase 1 By JM Date 11/30/09

Location EAST, Entrance Drive Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.2A	91			.6	55
C	Wooded Good 10.2C	70			.3	21
				Totals =	.9	76

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{76}{.9} = 85$; Use CN = [85]

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in	4.6	2.3	

(Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)

rev

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre Phase 1 By JM Date ~~7/27/09~~ 11/30/09

Location East Entrance Drive Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)	Segment ID	AB		
1. Surface description (table 10.3).....		Open		
2. Manning's roughness coeff., n (table 10.3).		.011		
3. Flow length, L (total L ≤ 150 ft)	ft	150		
4. Two-yr 24-hr rainfall, P_2	in	4		
5. Land slope, s	ft/ft	.07		
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr	.015	+	= .015

Shallow concentrated flow	Segment ID			
7. Surface description (paved or unpaved)		UP		
8. Flow length, L	ft	70		
9. Watercourse slope, s	ft/ft	.07		
10. Average velocity, V (figure 10.10).....	ft/s	4.2		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr	.004	+	= .004

Channel flow	Segment ID			
12. Cross sectional flow area, a	ft^2			
13. Wetted perimeter, P_w	ft			
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$ Compute V	ft/s			
18. Flow length, L	ft			
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		+	= .019

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Bellemere Phase 1 By JM Date 7/27/09 1/21/09

Location EAST ENTRANCE Checked ____ Date ____

Circle one: Present Developed

1. Data:

Drainage area ..... A_m = .9 Acre 0.0014 mi^2 (acres/640)

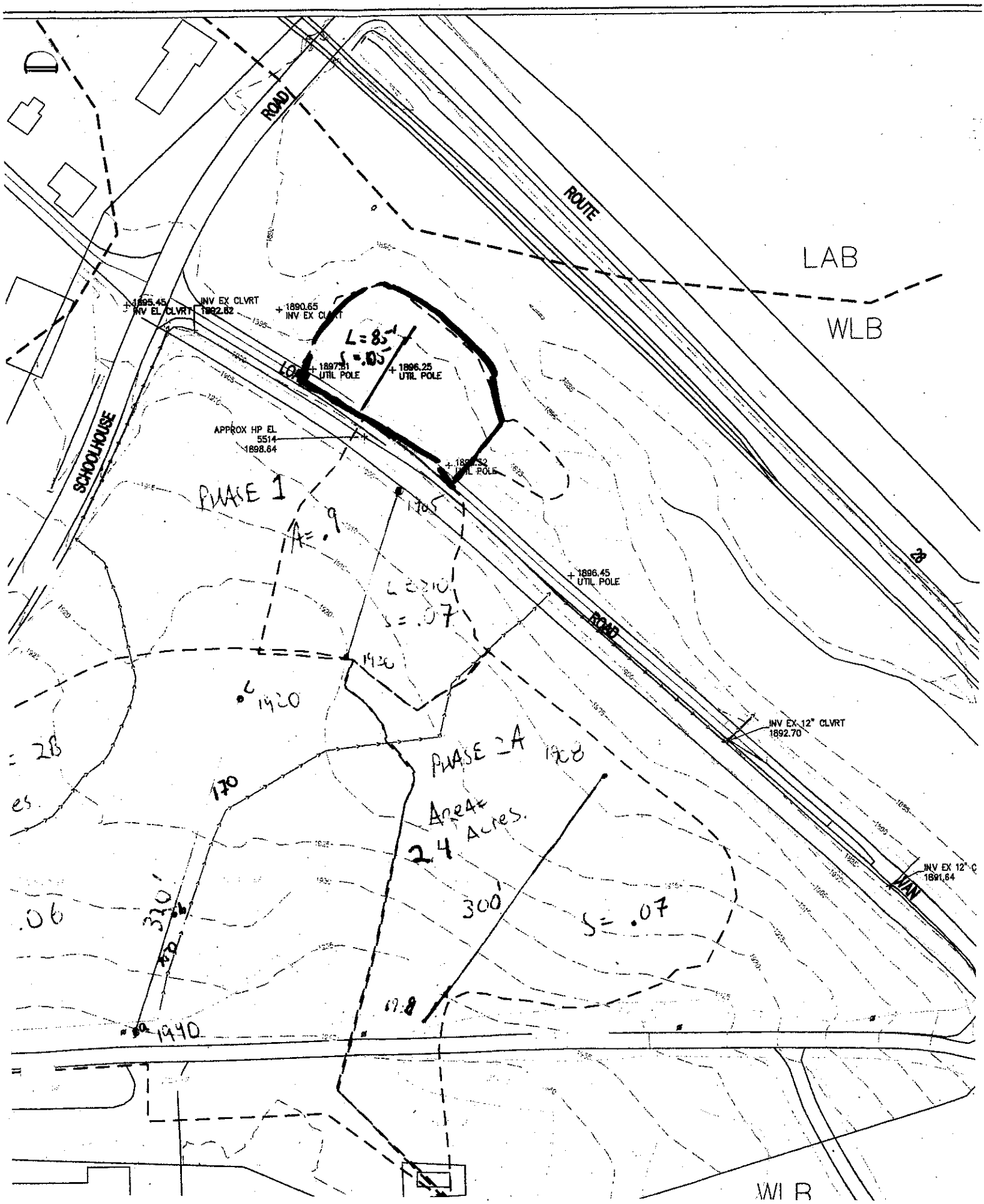
Runoff curve number .... CN = 88 (From worksheet 2)

Time of concentration .. T_c = .019 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.273	.273	
5. Compute I_a/P		.045	.033	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	4.6	2.3	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	6.4	3.2	


ROAD
ROUTE
LAB
WLB
SCHOOLHOUSE
INV EX CLVRT
1892.82
1895.45
INV EL CLVRT
1890.65
INV EX CLVRT
1897.31
UTIL POLE
1896.25
UTIL POLE
APPROX HP EL
5514
1898.64
1896.45
UTIL POLE
ROAD
INV EX 12" CLVRT
1892.70
INV EX 12" C
1891.84
WAN
WLB
L = 85'
S = .05
PHASE 1
A = .9
L = 310'
S = .07
PHASE 2A
Area = 2.4 Acres.
300'
S = .07
320'
170
1920
1940
1908

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre East Parking By JM Date 2/3/10

Location FP-D- Kiosk Checked ____ Date ____

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10,2A	91			.425	
					Totals = .425	

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = ____ = ____ Use CN = 91

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	4.85	2.46	

rev

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleaire East Discovery Park By JM Date 2/3/10

Location EP-D 1 (kiosk) Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES; Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID		
1. Surface description (table 10.3).....		AB		
2. Manning's roughness coeff., n (table 10.3).		OPEN		
3. Flow length, L (total L ≤ 150 ft)	ft	.011		
4. Two-yr 24-hr rainfall, P_2	in	85		
5. Land slope, s	ft/ft	4		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr	.05		
		.011	+	- .011

Shallow concentrated flow		Segment ID		
7. Surface description (paved or unpaved)				
8. Flow length, L	ft			
9. Watercourse slope, s	ft/ft			
10. Average velocity, V (figure 10.10).....	ft/s			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+	-

Channel flow		Segment ID		
12. Cross sectional flow area, a	ft^2			
13. Wetted perimeter, P_w	ft			
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s			
18. Flow length, L	ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+	-

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr .011

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre East Disc. Parking By JM Date 2/3/10

Location EP-D - Kiosk Checked ____ Date ____

Circle one: Present Developed

1. Data:

Drainage area ..... A_m = .425 Acre mi^2 (acres/640)

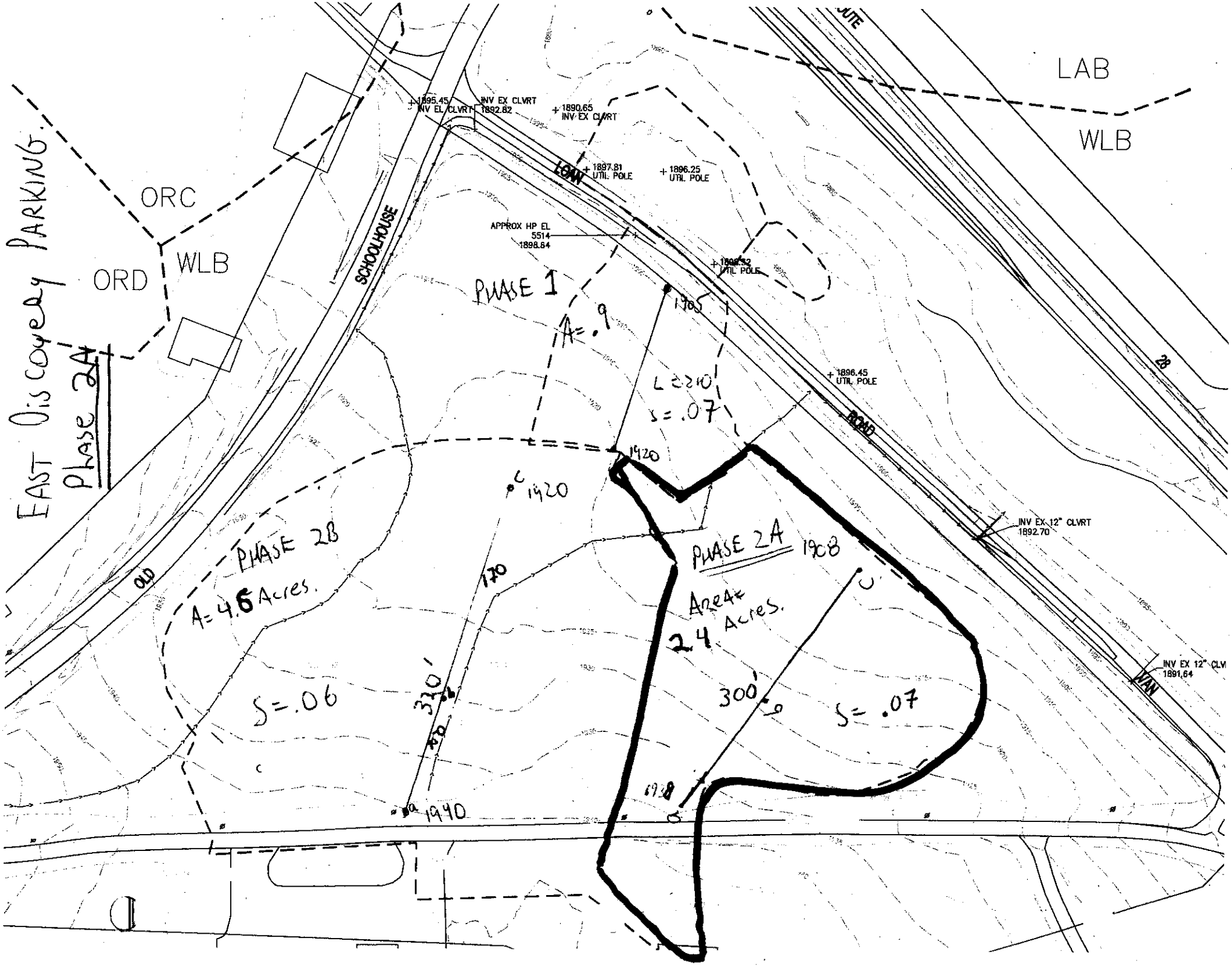
Runoff curve number .... CN = 91 (From worksheet 2)

Time of concentration .. T_c = .011 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.222	.222	
5. Compute I_a/P		.037	.037	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	4.85	2.46	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	3.2		


EAST Discovery PARKING.
Phase 2A
ORC
ORD
WLB
LAB
WLB
SCHOOLHOUSE
OLD
LOW
ROAD
VAN
1895.45
INV EL CLVRT
INV EX CLVRT
1892.82
1890.65
INV EX CLVRT
1897.81
UTIL POLE
1896.25
UTIL POLE
APPROX HP EL
5514
1898.64
1896.45
UTIL POLE
INV EX 12" CLVRT
1892.70
INV EX 12" CLV
1891.64
PHASE 1
A=.9
1705
L=210'
S=.07
1920
1920
PHASE 2B
A=4.6 Acres.
170
330'
S=.06
1940
PHASE 2A
1908
Area=
2.4 Acres.
300'
S=.07
1918

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellemere Phase 2A By JM Date 11/30/02

Location EAST PARKING Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.24	91			2	182
C	Wooded Good 10.2<	70			.4	28
				Totals =	2.4	210

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{210}{2.4} = 87.5$; Use CN = 88

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	4.6	1.79	

11/21

rev

Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre Phase 2A By JM Date 11/30/09

Location East Parking Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID	AB		
1. Surface description (table 10.3).....			Open		
2. Manning's roughness coeff., n (table 10.3).			.011		
3. Flow length, L (total L ≤ 150 ft)	ft		150		
4. Two-yr 24-hr rainfall, P_2	in		4		
5. Land slope, s	ft/ft		.07		
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr		.015	+	= .015
Shallow concentrated flow		Segment ID	BC		
7. Surface description (paved or unpaved)			Unpaved		
8. Flow length, L	ft		150		
9. Watercourse slope, s	ft/ft		.07		
10. Average velocity, V (figure 10.10).....	ft/s		4.2		
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		.001	+	= .001
Channel flow		Segment ID			
12. Cross sectional flow area, a	ft^2				
13. Wetted perimeter, P_w	ft				
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r	ft				
15. Channel slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$ Compute V	ft/s				
18. Flow length, L	ft				
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr			+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr				.015

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre Phase 2A By JM Date 11/30/09

Location East Discovery Parking. Checked ____ Date ____

Circle one: (Present) Developed

1. Data:

Drainage area ..... A_m = 2.4 .00375 mi^2 mi^2 (acres/640)

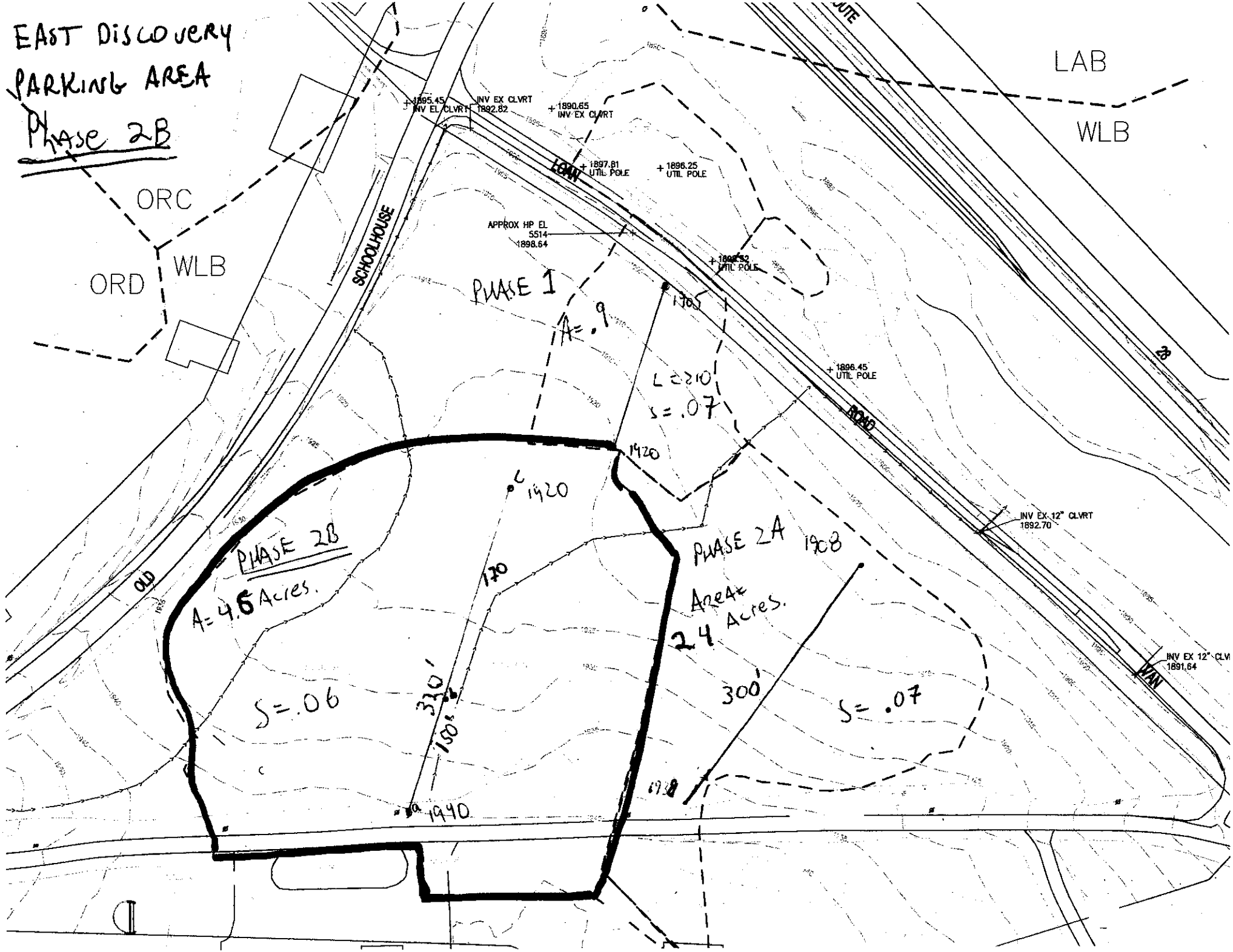
Runoff curve number .... CN = 88 (From worksheet 2)

Time of concentration .. T_c = .015 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.273	.273	
5. Compute I_a/P		.045	.078	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	4.6	1.79	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	17.3	6.7	


EAST DISCOVERY
PARKING AREA
PHASE 2B
ORC
ORD
WLB
LAB
WLB
SCHOOLHOUSE
OLD
LOAN
ROAD
ROUTE
28
PHASE 1
A=.9
L=210'
S=.07
1705
1920
1920
PHASE 2B
A=4.6 Acres.
170
330'
150'
S=.06
1940
PHASE 2A
1908
Area
2.4 Acres.
300'
S=.07
1918
1895.45
INV EL CLVRT
INV EX CLVRT
1892.82
1890.65
INV EX CLVRT
1897.81
UTIL POLE
1896.25
UTIL POLE
APPROX HP EL
5514
1898.64
1896.45
UTIL POLE
INV EX 12" CLVRT
1892.70
INV EX 12" CLV
1891.64

rev

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project Bellayre By JM Date 2/3/10

Location EAST Phase 2B (WEST SIDE) Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly Graded 10.2a	91			3.4	310
C	Woods, Good 10.2c	70			1.2	84
					Totals = 4.6	

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{394}{4.6} = 85.6$; Use CN = 86

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	1	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	4.4	2.1	

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Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre Phase 2B By JM Date 11/30/09

Location EAST Discovery PARKING. Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID	ab		
1. Surface description (table 10.3).....			open		
2. Manning's roughness coeff., n (table 10.3).			.011		
3. Flow length, L (total L ≤ 150 ft)	ft		150		
4. Two-yr 24-hr rainfall, P_2	in		4		
5. Land slope, s	ft/ft		.06		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr		.016	+	= .016

Shallow concentrated flow		Segment ID	bc		
7. Surface description (paved or unpaved)			UP		
8. Flow length, L	ft		170		
9. Watercourse slope, s	ft/ft		.06		
10. Average velocity, V (figure 10.10).....	ft/s		4		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		.01	+	= .01

Channel flow		Segment ID			
12. Cross sectional flow area, a	ft^2				
13. Wetted perimeter, p_w	ft				
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft				
15. Channel slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s				
18. Flow length, L	ft				
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr			+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr				.026

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project Belleayre East Parking By JM Date 3/3/10
Location Phase 2B (West side) Checked ____ Date ____
Circle one: Present Developed

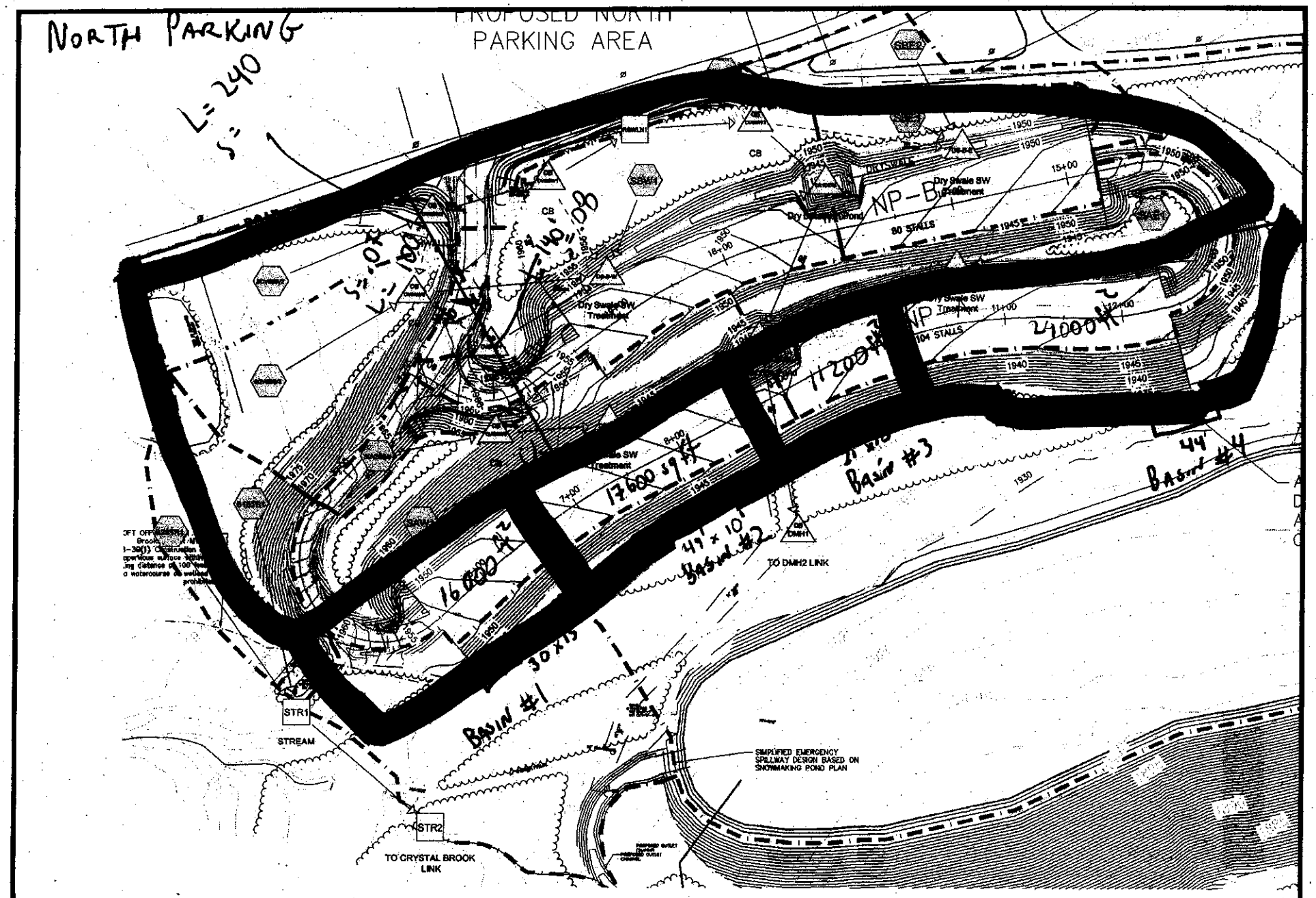
1. Data:

Drainage area ..... A_m = 4.6 mi^2 (acres/640)
Runoff curve number .... CN = 86 (From worksheet 2)
Time of concentration .. T_c = .026 hr (From worksheet 3)
Rainfall distribution type = II (I, IA, II, III)
Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.326	.326	
5. Compute I_a/P		.054	.09	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	1000	1000	
7. Runoff, Q ..... (From worksheet 2).	in	4.4	2.1	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	31.6	15.1	

TR-55 Peak Discharge Calculations

North Parking Area



Drainage Diagram for PR North Parking TIER A-B 1of2

Prepared by NYSDEC DOP BD&C, Printed 11/18/2009

HydroCAD® 8.50 s/n 005484 © 2007 HydroCAD Software Solutions LLC

Figure 10.5
Worksheet 2: Runoff Curve Number and Runoff
(Reprinted from 210-VI-TR-55, Second Ed., June 1986)

Project NORTH PARKING PHASE 1 By JM Date 11/30/09

Location NP-B DRYDET A BASIN Checked ____ Date ____

Circle one: (Present) Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (Exhibit 10.2)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 10.2	CN 1/ Figure 10.3	CN 1/ Figure 10.4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
C	Newly GRADED 10.2A	91			2.5	228
C	Woods Good 10.2C	70			1.5	105
				Totals =	4	333

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{333}{4} = 84$ Use CN = 84

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr	10	10	
Rainfall, P (24-hour) ..... in	6	3.5	
Runoff, Q ..... in (Use P and CN with table 10.1, fig. 10.1, or eqs. 10.3 and 10.4.)	4.4	1.9	

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Figure 10.11
Worksheet 3: Time of Concentration (T_c) or Travel Time (T_t)
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project North Disc. Parking. Phase 1 By Jm Date 11/20/09

Location NP-B Const Dry Det A sed basin Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)		Segment ID	AB	
1. Surface description (table 10.3).....			Wooded.	
2. Manning's roughness coeff., n (table 10.3).			.4	
3. Flow length, L (total L ≤ 150 ft)	ft		.00	
4. Two-yr 24-hr rainfall, P_2	in		4	
5. Land slope, s	ft/ft		.07	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t	hr		.19 +	= .20

Shallow concentrated flow		Segment ID	BC	
7. Surface description (paved or unpaved)			UP	
8. Flow length, L	ft		140	
9. Watercourse slope, s	ft/ft		.08	
10. Average velocity, V (figure 10.10).....	ft/s		4.8	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		.01 +	= .20

Channel flow		Segment ID		
12. Cross sectional flow area, a	ft^2			
13. Wetted perimeter, p_w	ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s			
18. Flow length, L	ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr			.20

Figure 10.14
Worksheet 4: Graphical Peak Discharge
(Reprinted from: 210-VI-TR-55, Second Ed., June 1986)

Project NORTH PARKING AREA phase 1 By JM Date 11/30/09

Location NP-B DryDet A Checked ____ Date ____

Circle one: Present Developed

1. Data:

Drainage area ..... A_m = .0062 (4 Acre) mi^2 (acres/640)

Runoff curve number .... CN = 86 (From worksheet 2)

Time of concentration .. T_c = .20 hr (From worksheet 3)

Rainfall distribution type = II (I, IA, II, III)

Pond and swamp areas spread throughout watershed ..... = 1 percent of A_m (____ acres or mi^2 covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	10	1	
3. Rainfall, P (24-hour)	in	6"	3.5	
4. Initial abstraction, I_a ..... (Use CN with table 10.4.)	in	.326	.326	
5. Compute I_a/P		.05	.09	
6. Unit peak discharge, q_u ..... (Use T_c and I_a/P with Figure 10.16)	csm/in	800	800	
7. Runoff, Q ..... (From worksheet 2).	in	4.4	1.9	
8. Pond and swamp adjustment factor, F_p .... (Use percent pond and swamp area with table 10.5. Factor is 1.0 for zero percent pond and swamp area.)		1	1	
9. Peak discharge, q_p ..... (Where $q_p = q_u A_m Q F_p$)	cfs	22	9.5	