Tab 7.0

7.0 OTHER PERMITS

Tab 8.0

8.0 ESC ANALYSIS AND DESIGN

TESC measures are put into place to prevent sediment from leaving the site. The site is generally flat. The proposed TESC plan will include, but not be limited to, the following guidelines set in the 2009 KCWSWDM in order to comply with Core Requirement No. 5.

1. Clearing Limits – Clearing limits specify the boundary of the work to be done. These limits are defined on the TESC plan set.

2. Cover Measures – Cover measures are involved (typically) with the means to control erosion of exposed soil and will be specified on the TESC plan set.

3. Perimeter Protection – Perimeter protection keeps site sediment from leaving. This type of protection typically involves a silt fence. The silt fence and clearing limits are shown on the TESC plans.

4. Traffic Area Stabilization – Traffic area stabilization will be addressed by a stabilized construction entrance.

5. Sediment Retention – Retention will be established by a sediment trap that is designed for the control of the on-site sediment-laden water.

6. Surface Water Collection – Dikes, ditches, and check dams will all be specified on the TESC plans.

7. Dust Control – Dust control will be provided.

Below is the sizing for the sediment trap for the developed basin

Q_2 = 0.228 cfs

SA at overflow = 2,080 x 0.228 = 474 s.f.

SEDIMENT TRAP SIZING

Gunnup Parcel
Sediment Trap Sizing

ENCLOSURE 4

```
                                KCRTS Command
                                -------------
                             CREATE a new Time Series
                             ------------------------
                          Production of Runoff Time Series
     Project Location : Sea-Tac
      Computing Series : 6622-trap.tsf
Regional Scale Factor :    1.00
            Data Type : Reduced
Creating 15-minute Time Series File
                        Loading Time Series
File:C:\KC_SWDM\KC_DATA\STTG15R.rnf    :
Till Grass                 0.23 acres
                        Loading Time Series
File:C:\KC_SWDM\KC_DATA\STEI15R.rnf    :
Impervious                 0.48 acres
                       --------------
         Total Area :     0.71 acres
Peak Discharge:  0.682 CFS at  6:30 on Jan  9 in Year 8
                                       Storing Time Series File:6622-
trap.tsf    :
                             Time Series Computed

                                KCRTS Command
                                -------------
                           Enter the Analysis TOOLS Module
                           -------------------------------

                              Analysis Tools Command
                              ----------------------
                          Compute PEAKS and Flow Frequencies
                          ----------------------------------
                                   Loading Stage/Discharge curve:6622-
trap.tsf    :
          Flow Frequency Analysis
          -----------------------------------------------------
  Time Series File:6622-trap.tsf
  Project Location:Sea-Tac
                              Frequencies & Peaks saved to File:6622-
trap.pks    :

                              Analysis Tools Command
                              ----------------------
                              RETURN to Previous Menu
                              -----------------------

                                KCRTS Command
                                -------------
                                eXit KCRTS Program
                                ------------------
```

Flow Frequency Analysis
Time Series File:6622-trap.tsf
Project Location:Sea-Tac

---Annual Peak Flow Rates---

Flow Rate (CFS)	Rank	Time of Peak
0.228	6	8/27/01 18:00
0.160	8	1/05/02 15:00
0.483	2	12/08/02 17:15
0.184	7	8/23/04 14:30
0.268	5	11/17/04 5:00
0.271	4	10/27/05 10:45
0.318	3	10/25/06 22:45
0.682	1	1/09/08 6:30

Computed Peaks

-----Flow Frequency Analysis-------

- - Peaks - - (CFS)	Rank	Return Period	Prob
0.682	1	100.00	0.990
0.483	2	25.00	0.960
0.318	3	10.00	0.900
0.271	4	5.00	0.800
0.268	5	3.00	0.667
0.228	6	2.00	0.500
0.184	7	1.30	0.231
0.160	8	1.10	0.091
0.616		50.00	0.980

$Q_2 = 0.228$ cfs

SA = 2,080 SF per cfs

SA = 2080 (0.228)

SA = 474 SF

Tab 9.0

9.0 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

The Bond Quantities, Facility Summaries and Declaration of Covenant will be included with the final submittal package.

City of Kirkland Public Works Department

IMPROVEMENT EVALUATION PACKET

The Improvement Evaluation Packet is used by the City of Kirkland Public Works Department to assess the dollar value of the public and private improvements being installed on development projects. The applicant filling out the packet is asked to provide the material quantities and to compute the value of the improvements using the unit prices established by the Public Works Department. The following are answers to commonly asked questions about the packet:

1. All development projects (subdivision, commercial, multi-family and industrial projects) applying for permit must complete the packet.

2. The dollar amounts generated are used to establish performance and maintenance security values, and review and inspection fees for Public Works.

3. Public work is considered to be any improvement installed in the right-of-way or in a public utility easement. If an improvement begins in the right-of-way and ends on the property, such as a sewer, it is considered both public and private work. The break occurs at structures within the right-of-way such as manholes, catch basins or water tees.

4. Private work is considered to be any of the listed improvements occurring on private property. However, **for subdivisions only**, storm drain detention systems are considered public work even when located on private property.

5. For subdivision projects, the Private Work section should include all on-site storm drainage and paving work. This will include the drainage system for the lot drains and the paving for private access easements. For all other classifications of projects, the Private Work section should include the on-site storm drainage system only.

6. After completion of the packet, the Public Works Department will verify the quantities and establish the security and fee values.

7. The Public Works Department will not release the permit for construction until the packet has been completed.

If you have any further questions about the packet, please call the Public Works Department at 425-587-3849.

ENCLOSURE 4

CONSTR. STORM DRAINAGE - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Silt Fence, Installed	LF		$4.50	
Grading for Drainage Swales	LF		$6.00	
Sod for Drainage Swales	SY		$6.00	
Hydroseeding	SY		$3.00	
Construction Entrance	EA		$1,500.00	
OTHER				
OTHER				

Construction Storm Drainage - Total	

CLEARING AND GRADING - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Half-Street Improvements	LF		$12.00	
Full Street Improvements	LF		$24.00	
OTHER				
OTHER				

Clearing and Grading - Total	

WATER SYSTEM - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Water service - 3/4" to 1"	LS		$1,600.00	
Water service - 1 1/2" to 2"	LS		$3,350.00	
4" Pipe	LF		$63.00	
6" Pipe	LF		$72.00	
8" Pipe	LF		$98.00	
2" Gate Valve (G.V.)	EA		$270.00	
4" G.V.	EA		$440.00	
6" G.V.	EA		$670.00	
8" G.V.	EA		$890.00	
Connection to ex. Main	EA		$3,000.00	
Fire Hydrant Assembly	EA		$3,800.00	
2" Blow Off	EA		$2,500.00	
Air and Vacuum Assembly	EA		$3,000.00	
Valve Marker Post	EA		$150.00	
OTHER				
OTHER				

Water System - Total	

STORM DRAINAGE SYSTEM - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
8" Pipe	LF		$41.00	
12" Pipe	LF		$49.00	
18" Pipe	LF		$60.00	
24" Pipe	LF		$76.00	
30" Pipe	LF		$82.00	
36" Pipe	LF		$88.00	
48" Pipe	LF		$98.00	
Detention Pipe	LF			
Detention Vault	LS			
Extra Depth Excav. (over 12' deep)	FT*LF		$6.00	
Curb Inlet	EA		$880.00	
Type I Catch Basin	EA		$1,150.00	
Type IL Catch Basin	EA		$1,400.00	
Type II CB - 48"	EA		$3,900.00	
Type II CB - 54"	EA		$4,000.00	
CMP Access Riser	EA		$1,600.00	
Connection to Existing CB	EA		$1,100.00	
Restrictor/Pollution Control - 8"	EA		$900.00	
Restrictor/Pollution Control - 12"	EA		$900.00	
Pollution Control Tee	EA		$500.00	
Debris Barrier	EA		$250.00	
Biofiltration Swale	LF		$15.00	
OTHER				
OTHER				

Storm Drainage System - Total	

PAVING - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
AC Pavement Patching	SY		$40.00	
4" Crushed Rock	SY		$10.00	
Bank Run Gravel: 3" minus, in place	CY		$31.00	
4" Asphalt Treated Base (ATB)	SY		$18.50	
2" Class B Asphalt Pavement	SY		$12.50	
Saw Cut AC Pavement	LF		$2.50	
Cold Planing (Grinding)	LF		$12.00	
OTHER				
OTHER				

Paving - Total	

CURB AND GUTTER - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Concrete Extruded Curb	LF		$5.00	
Asphalt Extruded Curb	LF		$5.00	
Conc. Curb & Gutter, Type A	LF		$21.00	
OTHER				
OTHER				

Curb and Gutter - Total	

SANITARY SEWER SYSTEM- PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
6" PVC pipe	LF		$105.00	
8" PVC pipe	LF		$122.00	
12" PVC pipe	LF		$155.00	
Extra Depth Excav. (over 12' deep)	FT*LF		$8.00	
Manhole, 48"	EA		$4,900.00	
Manhole, 54" (for drop MH's only)	EA		$5,500.00	
Internal Drop Structure	EA		$975.00	
Rechannel Existing MH	EA		$700.00	
Cast Iron Clean-Out Cover	EA		$160.00	
OTHER				
OTHER				

Sanitary Sewer System - Total	

SIDEWALKS - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
5' Concrete Sidewalk	LF	58	$30.00	$1,740
Concrete Sidewalk (other than 5')	SF		$5.80	
5' Concrete Driveway	LF		$29.00	
Asphalt Walkways, Class B	SY		$12.50	
Wheel Chair Ramps	EA	1	$1,600.00	$1,600
Steel Pipe Handrail	LF		$80.00	
Vinyl Fencing	LF		$40.00	
OTHER				

Sidewalks - Total	$3,340

LANDSCAPING - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Street Trees	EA		$350.00	
Sod	SY		$6.00	
Rockery Wall	SY		$200.00	
OTHER				
OTHER				

Landscaping - Total	

MISCELLANEOUS - PUBLIC WORK

Item	Unit	Quantity	Unit Price	Amount
Monuments	EA		$380.00	
Street Signs	EA		$220.00	
Pavement Marking	LF		$0.85	
Adjust Existing Utilities	EA		$350.00	
Mailbox Structure	EA		$350.00	
Type III Fixed Barricade	EA		$650.00	
Bollards	EA		$890.00	
Thermoplastic Crosswalk Markings	LF		$2.85 or $500 min	
OTHER				
OTHER				

Miscellaneous - Total	

PAVING - PRIVATE WORK

Item	Unit	Quantity	Unit Price	Amount
4" Crushed Rock	SY	2,496	$15.00	$37,440
4" Asphalt Treated Base (ATB)	SY		$18.50	
2" Class B Asphalt Pavement	SY	2,496	$18.75	$46,800
OTHER				
OTHER				

Paving - Total	$84,240

MISCELLANEOUS - PRIVATE WORK

Item	Unit	Quantity	Unit Price	Amount
Monuments	EA		$380.00	
Property Corners	EA		$265.00	
Street Signs	EA		$220.00	
Pavement Marking	LF	1,400	$0.85	$1,190
UG Utilities to Existing House	EA		$1,270.00	
Tight-Line ex. House Roof Drains	LF		$27.00	
OTHER				
OTHER				

Miscellaneous - Total	$1,190

STORM DRAINAGE SYSTEM - PRIVATE WORK

Item	Unit	Quantity	Unit Price	Amount
4" - 6" Pipe	LF		$16.00	
8" Pipe	LF	219	$41.00	$11,562
12" Pipe	LF	118	$49.00	$5,782
18" Pipe	LF		$60.00	
24" Pipe	LF		$76.00	
Detention Pipe	LF	1445	$90	$130,050
Detention Vault	LS			
Yard Basin	EA		$265.00	
Curb Inlet	EA		$880.00	
Type I Catch Basin	EA		$1,150.00	
Type IL Catch Basin	EA		$1,400.00	
Type II CB - 48"	EA		$3,900.00	
Type II CB - 54"	EA	1	$4,000.00	$4,000
CMP Access Riser	EA		$1,600.00	
Connection to Existing CB	EA	1	$1,100.00	$1,100
Restrictor/Pollution Control - 8"	EA		$900.00	
Restrictor/Pollution Control - 12"	EA	1	$900.00	$900
Pollution Control Tee	EA		$500.00	
Debris Barrier	EA		$250.00	
Biofiltration Swale	LF		$15.00	
OTHER Stormfilter 3 cartridge	EA	2	$15,100	$30,200
OTHER				

Storm Drainage System - Total	$188,194

IMPROVEMENT EVALUATION

This form must be completed by the developer (or representative) and shall include all work required by the official Notice of Approval or conditions on the permit. Quantity take-offs shall be from documents approved by the City of Kirkland.

PUBLIC WORK will be owned and maintained by the City after the appropriate maintenance period and will be subject to review and inspection fees per KMC Section 5.7A.50. For subdivision work, this will include the on-site detention system.

PRIVATE WORK will be owned and maintained by the property owner(s), and is not subject to the above fees. For subdivisions, include the remainder of the on-site storm drainage system (excluding the detention system) and any easement road paving. For all other types of projects, include the on-site storm drainage system only.

	Column 1	*Column 2*	*Column 3*
Items Required	**Value of Public Work**	**Value of Private Work**	**Total Value**
1. Constr. Storm Drainage			
2. Clearing and Grading			
3. Water System			
4. Sanitary Sewer System			
5. Storm Drainage System		$188,194	$188,194
6. Paving		$84,240	$84,240
7. Curb and Gutter			
8. Sidewalks	$3,340		$3,340
9. Landscaping			
10. Miscellaneous		$1,190	$1,190
11.			
12.			
TOTALS	$3,340	$273,624	$276,964

I hereby certify the above to be an accurate representation of the required construction for the above referenced project.

(Agent) / Owner Barghausen Consulting Engineers, Inc. Cara Visintainer, P.E. Date 3/16/12

City Date

MAINTENANCE Column 1 + private storm x .1 x. 1.3

PUBLIC WORKS DEPARTMENT
IMPROVEMENT EVALUATION SUMMARY

Type of project: ☐ Subdivision ☑ Commercial ☐ Single Family ☐ Multi-Family ☐ Muni/Gov't ☐ Miscellaneous

Project Name: Costco Wholesale Parking Lot

Project Location: 8629 - 120th Avenue N.E.

Permit No.:

Contact: Barghausen Consulting Engineers, Inc. Cara Visintainer

Phone No.: (425) 251-6222

for applications received on or after 1/1/2009

**** FOR CITY USE ONLY ****

1. Total Value of Public Work Required:	
2. Review & Inspection Fee * :	
3. Total Value of Private Work Required:	
4. Performance Security Value:	
5. Maintenance Security Value:	

*The Review and Inspection Fee is 10% of Total Value of Public Work Required (column 1), plus value of private storm (column 2, #5)

Tab 10.0

10.0 OPERATIONS AND MAINTENANCE MANUAL

The drainage facilities on this project will be public facilities owned and maintained by the City of Kirkland. The Operations and Maintenance Manual will be provided in the final version of this report.

ENCLOSURE 5

NE 90th/120th NE Drainage

Legend

Surface Water Lines

LINE_TYPE

- Culvert
- Ditch
- Pipe
- Stream
- Swale
- Tank

Two Foot Contours (Cartographic)

TYPE

- Contour
- Index Contour
- Contour (Depression)
- Index Contour (Depression)
- Wetlands

0 50 100 150 200 Feet

0 0.009 0.018 0.027 0.036 Miles

CITY OF KIRKLAND WASHINGTON

Author:
Name: Hauge SEPA Appeal - Closeup
Date Saved: 3/26/2012 3:50:07 PM

Enclosure 5

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ENCLOSURE 6

NE 90th/120th NE Drainage Closeup

Legend

Surface Water Lines

LINE_TYPE

- Culvert
- Ditch
- Pipe
- Stream
- Swale
- Tank

Two Foot Contours (Cartographic)

TYPE

- Contour
- Index Contour
- Contour (Depression)
- Index Contour (Depression)
- Wetlands

0 10 20 30 40 Feet

0 0.003 0.006 0.009 0.012 Miles

CITY OF KIRKLAND WASHINGTON

Author:
Name: Hauge SEPA Appeal - Closeup
Date Saved: 3/26/2012 3:50:07 PM

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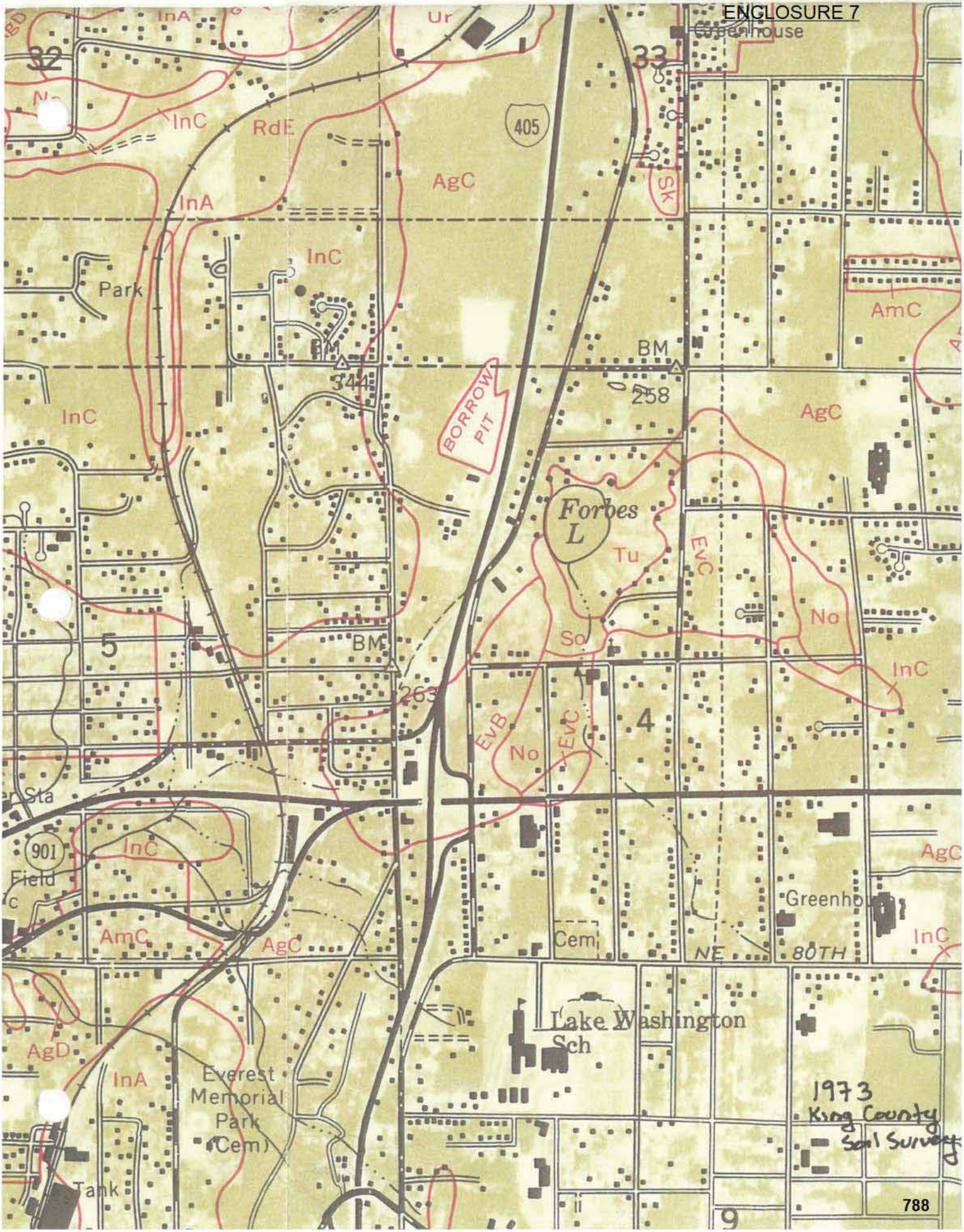
Enclosure 6

ENCLOSURE 7

Excerpts From
Soil Survey
King County Area Washington
United States Department of Agriculture
Soil Conservation Service in Cooperation
with
Washington Agricultural Experiment Station
November 1973

ENCLOSURE 7


32
33
InA
Ur
Greenhouse
InC
RdE
405
AgC
Sk
InA
InC
Park
AmC
BM
344
BM
258
BORROW PIT
InC
AgC
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EvC
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5
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263
EvB
No
EvC
4
Sta
901
InC
Field
AgC
Greenho
AmC
AgC
Cem
NE
80TH
InC
Lake Washington Sch
AgD
InA
Everest Memorial Park (Cem)
Tank
1973
King County
Soil Survey
9
788

B1--7 to 25 inches, dark grayish-brown (2.5Y 4/2) silt loam, grayish brown (2.5Y 5/2) dry; massive; slightly hard, very friable, slightly sticky, slightly plastic; many roots; medium acid; clear, smooth boundary. 16 to 20 inches thick.

B21g--25 to 40 inches, dark grayish-brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles, faint light yellowish brown (2.5Y 6/4) dry; massive; slightly hard, very friable, slightly sticky, slightly plastic; common roots; medium acid; clear, wavy boundary. 13 to 18 inches thick.

B22g--40 to 46 inches, very dark gray (5Y 3/1) loamy sand, grayish brown (2.5Y 5/2) dry; common, medium, distinct, dark yellowish-brown (10YR 3/4) mottles; massive; soft, very friable, nonsticky, nonplastic; few roots; slightly acid; clear, wavy boundary. 3 to 8 inches thick.

B23--46 to 60 inches, olive-gray (5Y 4/2) silt loam and very fine sandy loam, light brownish gray (2.5Y 6/2) dry; common, medium, prominent, dark yellowish-brown (10YR 4/4) mottles, yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) dry; massive; slightly hard, very friable, nonsticky, nonplastic; few roots; slightly acid.

The A horizon ranges from dark grayish brown to very dark grayish brown. The B horizon ranges from dark grayish brown and dark gray to very dark gray and olive gray, and from silt loam to very fine sandy loam. In places it contains thin lenses of fine sand, loamy sand, and sandy loam. The number and prominence of mottles increase below a depth of 20 inches.

Some areas are up to 15 percent inclusions of a deep, stratified Edgewick sandy loam; some are up to 5 percent the sandy Pilchuck soils; and some are up to 5 percent the wet Bellingham, Seattle, and Tukwila soils.

Permeability is moderate. The effective rooting depth is 60 inches and more. The seasonal high water table is at a depth of 2 to 4 feet. The available water capacity is high. Runoff is slow, and the hazard of erosion is slight. Stream overflow is a moderate hazard.

This soil is used for row crops and pasture. Capability unit IIw-1; woodland group 2o1.

Snohomish Series

The Snohomish series is made up of poorly drained soils that formed in alluvium in stream valleys. Slopes are 0 to 2 percent. Annual precipitation is 35 to 50 inches, and the mean annual air temperature is about 50° F. The frost-free season ranges from 150 to 200 days. Elevation ranges from about sea level to 300 feet.

In a representative profile, the surface layer and subsoil are very dark grayish-brown and grayish-brown silt loam and clay loam about 17 inches thick. Below this is black mucky peat about 10 inches thick. The substratum is dark-gray loamy fine san that extends to a depth of 60 inches or more.

Snohomish soils are used for row crops, pasture and hay.

Snohomish silt loam (So).--This nearly level so is in areas that are irregular in shape and range from 2 to about 400 acres in size.

Representative profile of Snohomish silt loam, pasture, 1,050 feet east and 500 feet south of the northwest corner of sec. 24, T. 21 N., R. 4 E.:

Ap--0 to 8 inches, very dark grayish-brown (10YR 3 silt loam, light grayish brown (10YR 6/2) dr few, fine, distinct, yellowish-brown (10YR 5 mottles, brownish yellow (10YR 6/6) dry; moc erate, fine, granular structure; slightly ha friable, slightly sticky, plastic; many roo medium acid; abrupt, smooth boundary. 6 to inches thick.

A1--8 to 11 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; mediu acid; abrupt, wavy boundary. 1 to 3 inches thick.

B2g--11 to 17 inches, grayish-brown (2.5Y 5/2) cl loam, light gray (2.5Y 7/2) dry; black (10Y 2/1) mucky peat, very dark gray and dark gr (10YR 3/1 and 4/1) dry; many, medium, promi mottles of reddish brown and yellowish red (5YR 4/4 and 5/6), common, fine, prominent mottles of brownish yellow (10YR 6/6 and 6/ dry; moderate, medium, granular structure; hard, firm, sticky, plastic; few roots; med acid; abrupt, wavy boundary. 6 to 26 inche thick.

IIOe--17 to 27 inches, black (10YR 2/1) moist, mu peat, very dark brown (10YR 2/2) dry; massi hard, very friable, nonsticky, nonplastic; roots; medium acid; abrupt, wavy boundary. to 25 inches thick.

IIICg--27 to 60 inches, loamy fine sand, dark gra (N 4/0) moist; gray (5Y 5/1) dry; few, fine distinct mottles of light brownish gray (2. 6/2) dry; massive; soft, very friable, non-sticky, nonplastic; few roots; medium acid.

The A horizon ranges from very dark grayish br to dark brown. The B horizon ranges from very da grayish brown to gray and from silt loam to silty clay loam and loamy sand. Depth to layers of pea material ranges from 13 to 36 inches. The peaty layers are black to reddish black and are 10 inch or more thick. Layers of silty clay loam to loamy sand occur within and below the peaty layers.

Some areas are up to 20 percent included Woodi ville soils; and some are up to 5 percent Seattle Tukwila, and Shalcar soils.

Permeability is moderate in the upper part of profile and moderately rapid in the lower part. T is a seasonal high water table at or near the su In drained areas, the effective rooting depth is

inches or more. In undrained areas, rooting depth is restricted. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Stream overflow is a severe hazard.

This soil is used for row crops, pasture, and h[illegible] apability unit IIw-2; woodland group 3w2.

Snohomish Series, Thick Surface Variant

Snohomish series, thick surface variant, is made up of somewhat poorly drained soils that formed in alluvial deposits of diatomaceous material on the flood plain of the Sammamish Valley. Slopes are 0 to 2 percent. The annual precipitation is 45 to 50 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 200 days. Elevation ranges from about sea level to 40 feet.

In a representative profile, the surface layer is very dark brown silt loam about 10 inches thick. The next layers are very dark grayish-brown and light-gray silt loam and very fine sandy loam about 19 inches thick. Below this is black muck that extends to a depth of 60 inches or more.

These soils are used for row crops, hay, or pasture.

Snohomish silt loam, thick surface variant (Sr).--This soil is nearly level. Areas are irregular in shape and range from 1 acre to nearly 200 acres in size.

Representative profile of cultivated Snohomish silt loam, 820 feet north and 250 feet east of the west quarter corner of sec. 26, T. 26 N., R. 5 E.:

Ap to 10 inches, very dark brown (7.5YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak, fine and coarse, crumb structure; soft, very friable, nonsticky, slightly plastic; common roots; slightly acid; abrupt, wavy boundary. 10 to 12 inches thick.

C1--10 to 18 inches, very dark grayish-brown (10YR 3/2) and brown (10YR 5/3) silt loam, light gray (2.5Y 7/2) dry; few, fine, prominent (10YR 7/6 and 6/8) mottles in root casts; moderate, very coarse, prismatic structure; hard, friable, slightly sticky, slightly plastic; common roots; medium acid; abrupt, wavy boundary. 4 to 12 inches thick.

IIC2--18 to 20 inches, light-gray (10YR 7/2) and dark yellowish-brown (10YR 4/4) very fine sandy loam (volcanic ash), white (10YR 8/1) and very pale brown (10YR 7/4) dry; massive; slightly hard, friable, nonsticky, nonplastic; common roots; slightly acid; abrupt, wavy boundary. 3/4 inch to 2 inches thick.

IIIC3--20 to 29 inches, very dark grayish-brown (10YR 3/2) and light brownish-gray (10YR 6/2) silt loam, light brownish gray (10YR 6/2) and very pale brown (10YR 7/4) dry; moderate, very coarse, prismatic structure that parts to very coarse platy structure; slightly hard, friable, nonsticky, slightly plastic; few roots; medium acid; clear, smooth boundary. 4 to 14 inches thick.

IVOa--29 to 60 inches, black (5YR 2/1) muck, black (5YR 2/1) dry; moderate, very coarse, prismatic structure; slightly hard, very friable, nonsticky, nonplastic; few roots; very strongly acid. Several feet thick.

The mineral layers above the muck range from very dark brown to very dark grayish brown. The lower part of the mineral layer commonly ranges from light brownish gray to very dark brown. Layers of very fine sandy loam volcanic ash commonly occur in the lower half of the mineral layer. The depth to muck ranges from 20 to 40 inches.

Soils included with this soil in mapping make up no more than 25 percent of the total acreage. Some areas are up to 25 percent the very deep Earlmont silt loam; and some are up to 15 percent the very deep Tukwila muck.

Permeability is moderate. There is a seasonal high water table at a depth of 2 to 3 feet. In drained areas, the effective rooting depth is 60 inches or more. Available water capacity is high. Runoff is very slow, and the erosion hazard is slight. This soil is subject to occasional flooding.

This soil is used for row crops, pasture, and hay. Capability unit IIw-2; woodland group 3w2.

Sultan Series

The Sultan series is made up of moderately well drained soils that formed in alluvium, under grass and hardwoods, in the major stream valleys. Slopes are 0 to 2 percent. The annual precipitation is 35 to 50 inches, and the mean annual air temperature is about 50° F. The frost-free season ranges from 150 to 200 days. Elevation ranges from about sea level to 85 feet.

In a representative profile, the surface layer is very dark grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled yellowish-brown, light olive-brown, grayish-brown, and olive-gray, stratified silty clay loam, silt loam, very fine sandy loam, and medium sand.

Sultan soils are used for row crops and pasture.

Sultan silt loam (Su).--This gently undulating soil is on bottom land. Slopes are less than 2 percent. Areas are irregular in shape and range from 2 to about 200 acres in size.

Representative profile of Sultan silt loam, in pasture, 500 feet east, 250 feet east and 250 feet north of the south quarter corner of sec. 9, T. 25 N., R. 7 E.:

Ap--0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate, medium, granular structure; hard, firm, sticky, and plastic; many roots; slightly acid; abrupt, smooth boundary. 6 to 10 inches thick.

B21--9 to 21 inches, yellowish-brown (10YR 5/4) silty clay loam, pale brown (10YR 6/3) dry; moderate, fine, subangular blocky structure;

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dry; massive; slightly hard, very friable; nonsticky, nonplastic; few roots; neutral.

The A horizon ranges from very dark grayish brown to very dark brown. The C horizon consists of layers of silt loam, very fine sandy loam, sandy loam, loamy sand, and sand; the thickness of each layer varies. Mottles occur at a depth below 30 to 40 inches in some places.

Some areas are up to 25 or 30 percent inclusions of somewhat poorly drained Briscot, Oridia, and Woodinville soils; and some are up to 10 percent the poorly drained Puget soils. Total inclusions do not exceed 30 percent.

Permeability is moderate. The effective rooting depth is 60 inches or more. A seasonal water table is at a depth of 3 to 4 feet in places. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. The hazard of stream overflow is slight to severe, depending on the amount of flood protection provided.

This soil is used mostly for row crops. Capability unit IIw-1; woodland group 2o1.

Nooksack Series

The Nooksack series is made up of well-drained soils that formed in alluvium in river valleys, under a cover of grass, conifers, and hardwoods. Slopes are 0 to 2 percent. The annual precipitation is 35 to 55 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 190 days. Elevation ranges from about sea level to 500 feet.

In a representative profile, the soil is very dark grayish-brown, dark grayish-brown, and grayish-brown silt loam to a depth of 60 inches or more.

Nooksack soils are used for row crops and pasture and for urban development.

Nooksack silt loam (Nk).--This nearly level soil is in long, narrow areas that range from 5 to about 300 acres in size. Slopes are less than 2 percent.

Representative profile of cultivated Nooksack silt loam, 1,800 feet east and 500 feet south of the west quarter corner of sec. 4, T. 24 N., R. 7 E.:

Ap1--0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, thin, platy structure; slightly hard, very friable, nonsticky, nonplastic; many roots; slightly acid; abrupt, smooth boundary. 2 to 3 inches thick.

Ap2--2 to 11 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak, coarse, prismatic structure; slightly hard, very friable, nonsticky, nonplastic; common roots; slightly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B2--11 to 29 inches, dark grayish-brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; weak, medium, prismatic structure and weak, medium, subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common roots; medium acid; clear, smooth boundary. 17 to 21 inches thick.

C1--29 to 42 inches, dark grayish-brown (10YR 4/2) and grayish-brown (2.5Y 5/2) silt loam and thin lenses of very fine sandy loam, light brownish gray (2.5Y 6/2) dry; massive; sligh ly hard, very friable, nonsticky, nonplastic common roots; slightly acid; clear, smooth boundary. 10 to 15 inches thick.

C2--42 to 60 inches, grayish-brown (2.5Y 5/3) silt loam, light brownish gray (2.5Y 6/2) dry; massive; hard, friable, sticky, plastic; com mon roots; medium acid.

The B and C horizons are mostly silt loam and very fine sandy loam and have lenses of silty clay loam and fine sandy loam. The C horizon is dark grayish brown, grayish brown, or dark brown.

Some areas are up to 5 percent included poorly drained Puget soils; and some are 10 to 15 percent the somewhat poorly drained Oridia and Briscot soi Also included with this soil in mapping are areas of the poorly drained Woodinville silt loam and a few areas of a Woodinville silty clay loam. Inclu soils make up no more than 15 percent of the total acreage.

Permeability is moderate. The effective rootin depth is 60 inches or more. A seasonal water tabl is at a depth of 3 to 4 feet in places. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Stream overflow is a mo erate to severe hazard.

This soil is used for row crops and pasture and for urban development. Capability unit IIw-1; woc land group 2o1.

Norma Series

The Norma series is made up of poorly drained soils that formed in alluvium, under sedges, grass conifers, and hardwoods. These soils are in basir on the glaciated uplands and in areas along the stream bottoms. Slopes are 0 to 2 percent. The annual precipitation is 35 to 60 inches, and the mean annual air temperature is about 50° F. The frost-free season is 150 to 200 days. Elevation ranges from about sea level to 600 feet.

In a representative profile, the surface layer black sandy loam about 10 inches thick. The subsc is dark grayish-brown and dark-gray sandy loam anc extends to a depth of 60 inches or more.

Norma soils are used mainly for pasture. If drained, they are used for row crops.

Norma sandy loam (No).--This soil occurs as str 25 to 300 feet wide. Slopes are less than 2 perce Areas are level or concave and range from 1 to abc 100 acres in size.

Representative profile of Norma sandy loam, in pasture, 725 feet east and 50 feet north of the south quarter corner of sec. 31, T. 20 N., R. 7 E.:

Ap--0 to 10 inches, black (10YR 2/1) sandy loam, dark grayish brown (10YR 4/2) dry; moderate, fine, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many roots; slightly acid; abrupt, smooth boundary. 10 to 12 inches thick.

B21g--10 to 30 inches, dark grayish-brown (2.5Y 4/2) sandy loam, light brownish gray (2.5Y 6/2) dry; many, medium, prominent, yellowish-red (5YR 4/8) and brown (7.5YR 4/4) mottles, very pale brown (10YR 7/4) and reddish yellow (7.5YR 6/8) dry; thin platy structure; hard, very friable, nonsticky, nonplastic; few roots; slightly acid; clear, wavy boundary. 19 to 24 inches thick.

B22g--30 to 60 inches, dark-gray (5Y 4/1) sandy loam, light gray (5Y 7/1) dry; common, fine, prominent, strong-brown (7.5YR 5/6) and reddish-yellow (7.5YR 6/6) mottles, yellowish brown (10YR 5/8) and pale brown (2.5Y 7/4) dry; massive; slightly hard, very friable, nonsticky, nonplastic; few roots; slightly acid.

The A horizon ranges from black to very dark brown and is as much as 15 percent gravel. The B horizon commonly is sandy loam that in places is stratified with silt loam and loamy sand. It is as much as 35 percent gravel in some places. The B horizon is mottled gray, dark gray, and dark grayish brown.

Some areas are up to 5 percent included Seattle, Tukwila, and Shalcar soils; and some are up to 5 percent Alderwood and Everett soils, at the slightly higher elevations. In the area northwest of Auburn, in Green River Valley, there are areas of Norma soil that have an organic surface layer as thick as 12 inches in some places. Also included are small areas of Norma soils that have a silt loam surface layer.

Permeability is moderately rapid. The seasonal water table is at or near the surface. In drained areas, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. The available water capacity is moderately high to high. Runoff is slow, and the erosion hazard is slight. Stream overflow is a severe hazard in places.

This soil is used mostly for pasture. Drained areas are used for row crops. Capability unit IIIw-3; woodland group 3w2.

Orcas Series

The Orcas series is made up of very poorly drained organic soils that formed in sphagnum moss and small amounts of Labrador tea and cranberry plants. These soils are in basins on the undulating, rolling glaciated uplands. Slopes are 0 to 1 percent. Annual precipitation is 35 to 60 inches, and the mean annual air temperature is about 50° F. The frost-free season is 160 to 180 days. Elevation ranges from 100 to 500 feet.

In a representative profile, the surface layer is dark reddish-brown sphagnum peat about 6 inches thick. The next layer is yellowish-red sphagnum peat that extends to a depth of about 60 inches.

Orcas soils are used mostly as wildlife habitat.

Orcas peat (Or).--This level or slightly concave soil is in irregularly shaped areas that range from 2 to about 10 acres in size. Slopes are less than 1 percent.

Representative profile of Orcas peat, under wild cranberries, 600 feet north and 650 feet west of the east quarter corner of sec. 8, T. 24 N., R. 6 E.:

Oi1--0 to 6 inches, dark reddish-brown (5YR 3/2) sphagnum peat, very pale brown (10YR 7/3) dry; soft, spongy; many roots; extremely acid; clear, smooth boundary. 6 to 8 inches thick.

Oi2--6 to 60 inches, yellowish-red (5YR 5/6, 4/6, 4/8) sphagnum peat, very pale brown (10YR 7/4) dry; soft, spongy; few roots; extremely acid.

The Oi1 horizon ranges from dark reddish brown to reddish black. Only slight decomposition has occurred. The Oi2 horizon is uniformly sphagnum peat that ranges from dark reddish brown through yellowish red to very pale brown.

Some areas mapped are up to 20 percent included Seattle and Tukwila mucks, and some are up to 5 percent the wet Bellingham soils.

Permeability is very rapid. There is a water table at or close to the surface for several months each year. In areas where the water table is controlled, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. The available water capacity is high. Runoff is ponded, and there is no erosion hazard.

This soil is used mostly as wildlife habitat. Capability unit VIIIw-1; no woodland classification.

Oridia Series

The Oridia series is made up of somewhat poorly drained soils that formed in alluvium in river valleys. Slopes are 0 to 2 percent. The annual precipitation is 35 to 55 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 200 days. Elevation ranges from about 0 to 85 feet.

In a representative profile, the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is grayish-brown, dark grayish-brown, and gray silt loam and silty clay loam that extends to a depth of 60 inches or more.

Oridia soils are used for row crops and pasture and for urban development.

Oridia silt loam (Os).--This gently undulating soil is in irregularly shaped areas. Slopes are less than 2 percent. Areas range from 10 to more than 200 acres in size.

Representative profile of Oridia silt loam, in pasture, 850 feet north, 620 feet east of the southwest corner of sec. 12, T. 22 N., R. 4 E.:

hard, friable, sticky, and plastic; many roots; slightly acid; clear, wavy boundary. 10 to 14 inches thick.

B22g--21 to 24 inches, light olive-brown (2.5Y 5/4) silt loam, pale yellow (2.5Y 7/4) dry; many, medium, prominent, yellowish-brown (10YR 5/8) mottles, brownish yellow (10YR 6/8) dry; moderate, medium, subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; common roots; neutral; clear, wavy boundary. 2 to 5 inches thick.

B23g--24 to 48 inches, grayish-brown (2.5Y 5/2) silty clay loam, white (2.5Y 8/2) dry; many, medium, prominent, yellowish-brown (10YR 5/8) mottles, yellow (10YR 7/8) dry; moderate, medium, prismatic structure; slightly hard, very friable, sticky, plastic; few roots; neutral; clear, wavy boundary. 20 to 30 inches thick.

B31--48 to 66 inches, olive-gray (5Y 5/2) very fine sandy loam stratified with medium sand, light gray (2.5Y 7/2) dry; many, coarse, prominent, yellowish-red and strong-brown (5YR 5/8 and 5YR 5/6) mottles, strong brown (7.5YR 5/8) dry; massive; slightly hard, very friable, nonsticky, and nonplastic; few roots; neutral; clear, wavy boundary. 12 to 20 inches thick.

B32--66 to 72 inches, olive-gray (5Y 5/2) very fine sandy loam, light olive gray (5Y 6/2) dry; common, fine, prominent, yellowish-red (5YR 4/6) mottles, strong brown (7.5YR 5/8) dry; massive; slightly hard, very friable, nonsticky, nonplastic; very few roots; very strongly acid.

The A horizon ranges from very dark grayish brown to dark grayish brown. The B horizon ranges from dark grayish brown to olive gray and has brownish mottles. It is mostly silt loam and silty clay loam but in places contains a thin stratum of sand, loamy sand, or very fine sandy loam.

Some areas of this soil are up to 40 or 50 percent inclusions of Puget, Sammamish, and Oridia soils. Also included are small areas of Sultan silty clay loam.

Permeability is moderate. The effective rooting depth is 60 inches or more. A seasonal high water table is at a depth of 2 to 3 feet. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Stream overflow is a severe hazard in some areas.

This soil is used for row crops and pasture. Capability unit IIw-1; woodland group 3w1.

Tukwila Series

The Tukwila series is made up of very poorly drained organic soils that formed in decomposing sedges, rushes, grasses, and shrubs. These soils are in wet basins of upland depressions and on stream bottoms. Slopes are 0 to 1 percent. The annual precipitation ranges from 35 to 80 inches, and the mean annual temperature is about 50° F. The frost-free season is 150 to 200 days. Elevation ranges from 25 to 750 feet.

In a representative profile, dominantly black to very dark brown muck extends to a depth of 60 inches or more.

If drained, Tukwila soils are used for row crops. They are also used for pasture.

Tukwila muck (Tu).--This nearly level soil is in nearly circular and elongated areas that range from 1 to about 60 acres in size. Slopes are less than 1 percent.

Representative profile of Tukwila muck, in pasture, 320 feet west and 1,140 feet south of the center of sec. 4, T. 21 N., R. 5 E.:

Oa1--0 to 10 inches, black (10YR 2/1) muck, dark gray (10YR 4/1) dry; moderate, coarse, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many roots; extremely acid; abrupt, smooth boundary. 8 to 12 inches thick.

Oa2--10 to 16 inches, black (10YR 2/1) muck, brown (10YR 5/3) dry; ped exterior is dark gray (10YR 4/1) dry; moderate, very coarse, prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; very strongly acid; clear, smooth boundary. 6 to 9 inches thick.

Oa3--16 to 19 inches, black (10YR 2/1) muck, dark brown (10YR 3/3) dry grading to pale brown (10YR 6/3) in lower part; dark reddish-brown (5YR 3/3) ped interior; moderate, very coarse, prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; many roots; very strongly acid; abrupt, wavy boundary. 2 to 4 inches thick.

Ld1--19 to 21 inches, strong-brown (7.5YR 5/6) and very pale brown (10YR 7/3) silt loam (diatomite), light yellowish brown (10YR 6/4) dry; massive; slightly hard, very friable, nonsticky, nonplastic; many roots; very strongly acid; abrupt, smooth boundary. 1 to 3 inches thick.

Oa4--21 to 60 inches, very dark brown (10YR 2/2) muck that is 5 to 10 percent woody stems, dark brown (10YR 2/2) dry; massive; slightly hard, very friable, slightly sticky, slightly plastic; common roots to a depth of 30 inches, few roots below; very strongly acid. Several feet thick.

The underlying organic layers are strong-brown to very dark brown muck, peaty muck, and in places layers of diatomite 1 to 10 inches thick.

Some areas of this soil are up to 30 or 40 percent Seattle soils; and some are up to 5 percent the poorly drained Bellingham and Norma soils.

Permeability is moderate. There is a seasonal high water table at or near the surface. If the water table is controlled, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. Available water capacity is high. Runoff is ponded, and the erosion hazard is slight.

If drained, this soil is used for row crops. It is also used for pasture. Capability unit IIw-3; no woodland classification.

Urban Land

Urban land (Ur) is soil that has been modified by disturbance of the natural layers with additions of fill material several feet thick to accommodate large industrial and housing installations. In the Green River Valley the fill ranges from about 3 to more than 12 feet in thickness, and from gravelly sandy loam to gravelly loam in texture.

The erosion hazard is slight to moderate. No capability or woodland classification.

Woodinville Series

The Woodinville series is made up of nearly level and gently undulating, poorly drained soils that formed under grass and sedges, in alluvium, on stream bottoms. Slopes are 0 to 2 percent. The annual precipitation ranges from 35 to 55 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 190 days. Elevation ranges from about sea level to about 85 feet.

In a representative profile, gray silt loam, silty clay loam, and layers of peaty muck extend to a depth of about 38 inches. This is underlain by greenish-gray silt loam that extends to a depth of 60 inches and more.

Woodinville soils are used for row crops, pasture, and urban development.

Woodinville silt loam (Wo).--This soil is in elongated and blocky shaped areas that range from 5 to nearly 300 acres in size. It is nearly level and gently undulating. Slopes are less than 2 percent.

Representative profile of Woodinville silt loam, in pasture, 1,700 feet south and 400 feet west of the north quarter corner of sec. 6, T. 25 N., R. 7 E.:

Ap1--0 to 3 inches, gray (5Y 5/1) silt loam, grayish brown (10YR 5/2) dry; common, fine, prominent, dark reddish-brown (5YR 3/4) and reddish-brown (5YR 5/4) mottles; moderate, medium, crumb structure; hard, friable, sticky, plastic; many fine roots; medium acid; clear, smooth boundary. 2 to 4 inches thick.

Ap2--3 to 8 inches, gray (5Y 5/1) silty clay loam, light brownish gray (2.5Y 6/2) dry; many, fine, prominent, dark reddish-brown (5YR 3/3 and 3/4) mottles and common, fine, prominent mottles of strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) dry; moderate, fine and very fine, angular blocky structure; hard, friable, sticky, plastic; common fine roots; medium acid; abrupt, wavy boundary. 4 to 6 inches thick.

B21g--8 to 38 inches, gray (5Y 5/1) silty clay loam, gray (5Y 6/1) dry; common, fine, prominent, brown (7.5YR 4/4) mottles and medium, prominent mottles of brownish yellow (10YR 6/6) dry; 25 percent of matrix is lenses of very dark brown (10YR 2/2) and dark yellowish-brown (10YR 3/4) peaty muck, brown (7.5YR 4/2) dry; massive; hard, firm, sticky, plastic; few fine roots; medium acid; clear, smooth boundary. 30 to 40 inches thick.

B22g--38 to 60 inches, greenish-gray (5BG 5/1) silt loam, gray (5Y 6/1) dry; few, fine, prominent mottles of brownish yellow (10YR 6/6) dry; massive; hard, very friable, slightly sticky, slightly plastic; strongly acid.

The A horizon ranges from dark grayish brown to gray and from silt loam to silty clay loam. The B horizon ranges from gray and grayish brown to olive gray and greenish gray and from silty clay loam to silt loam. In places there are thin lenses of very fine sandy loam and loamy fine sand. Peaty lenses are common in the B horizon. These lenses are thin, and their combined thickness, between depths of 10 and 40 inches, does not exceed 10 inches.

Soils included with this soil in mapping make up no more than 25 percent of the total acreage. Some areas are up to 15 percent Puget soils; some are up to 10 percent Snohomish soils; and some areas are up to 10 percent Oridia, Briscot, Puyallup, Newberg, and Nooksack soils.

Permeability is moderately slow. There is a seasonal high water table at or near the surface. In drained areas, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. The available water capacity is high. Runoff is slow, and the hazard of erosion is slight. Stream overflow is a severe hazard unless flood protection is provided (pl. III, top).

This soil is used for row crops, pasture, and urban development. Capability unit IIw-2; woodland group 3w2.

and grass on valley floors in the vicinity of North Bend. Slopes are 0 to 3 percent. The annual precipitation is 70 to 80 inches, and the mean annual temperature is about 50° F. The frost-free season is about 150 days. Elevation ranges from 400 to 500 fe

In a representative profile, the surface layer is very dark grayish-brown to dark grayish-brown fine sandy loam that extends to a depth of about 34 inches. The underlying layers are black gravelly sand and gravelly sandy loam that extend to a depth of 60 inches or more.

Edgewick soils are used for pasture.

Edgewick fine sandy loam (Ed).--This soil is slightly convex or level. Areas are irregular in shape and range from 5 acres to more than 300 acres in size. Slope is less than 3 percent.

Representative profile of Edgewick fine sandy loam, in pasture, 1,430 feet east and 1,000 feet south of the west quarter corner of sec. 15, T. 23 N., R. 8 E.:

Ap--0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak, fine, granular structure; slightly hard, very friable, nonsticky, nonplastic; many roots; strongly acid; abrupt, smooth boundary. 8 to 11 inches thick.

C1--9 to 34 inches, dark grayish-brown (2.5Y 4/2) and olive-brown (2.5Y 4/4) fine sandy loam, grayish brown (2.5Y 5/2) dry; massive; soft, very friable, nonsticky, nonplastic; common roots; medium acid; abrupt, smooth boundary. 24 to 30 inches thick.

IIC--34 to 60 inches, black (5Y 2/2), stratified gravelly sand and gravelly sandy loam, grayish brown (2.5Y 5/2) dry; massive; soft, very friable, nonsticky, nonplastic; neutral.

The C horizon ranges from dark grayish brown to olive brown. The content of gravel is as much as 10 percent in places in the A horizon and the C1 horizon. The IIC horizon, at a depth below 32 to 40 inches, ranges from dark grayish brown to black and from stratified sand to fine sandy loam that has gravel in some places.

Soils included with this soil in mapping make up no more than 15 percent of the total acreage. Some areas are up to 10 percent Nooksack and Si soils; some are up to 5 percent Pilchuck soils, which occupy the natural levees along streams and the higher swells and undulations; some areas are up to 2 percent the poorly drained Puget soils; and some are 1 percent the poorly drained Seattle soils.

Permeability is moderately rapid. The effective rooting depth is restricted by the gravelly sand substratum. There is a seasonal high water table at a depth of 3 to 4 feet. Available water capacity is moderately high. Runoff is slow, and the erosion hazard is slight. The hazard of stream overflow is moderate to severe.

This soil is used for pasture. Capability unit IIIw-1; woodland group 2o1.

Everett Series

The Everett series is made up of somewhat excessively drained soils that are underlain by very gravelly sand at a depth of 18 to 36 inches. These soils formed in very gravelly glacial outwash deposits, under conifers. They are on terraces and terrace fronts and are gently undulating and moderately steep. Slopes are 0 to 30 percent. The annual precipitation is 35 to 60 inches, and the mean annual air temperature is about 50° F. The frost-free season ranges from 150 to 200 days. Elevation ranges from about sea level to 500 feet.

In a representative profile, the surface layer and subsoil are black to brown, gravelly to very gravelly sandy loam about 32 inches thick. The substratum extends to a depth of 60 inches or more. It is multicolored black to gray very gravelly sand (pl. I, left).

Everett soils are used for timber and pasture and for urban development.

Everett gravelly sandy loam, 0 to 5 percent slopes (EvB).--This nearly level to very gently undulating soil is on terraces. Areas are irregular in shape and range from 5 acres to more than 200 acres in size.

Representative profile of Everett gravelly sandy loam, 0 to 5 percent slopes, in forest, 450 feet west and 250 feet north of the southeast corner of sec. 30, T. 22 N., R. 7 E.:

O1--1 to 3/4 inch, undecomposed roots, twigs, and moss; abundant roots. 1 to 2 inches thick.

O2--3/4 inch to 0, black (10YR 2/1),decomposed organic matter; abundant roots. 3/4 of an inch to 1 1/2 inches thick.

A1--0 to 1 1/2 inches, black (10YR 2/1) sandy loam, gray (10YR 5/1) dry; massive; soft, very friable, nonsticky, nonplastic; many roots; slightly acid; abrupt, distinct boundary. 0 to 1 1/2 inches thick.

B2ir--1 1/2 to 17 inches, dark-brown (7.5YR 3/4) gravelly sandy loam, yellowish brown (10YR 5/4) dry; massive; soft, very friable, nonsticky, nonplastic; many roots; slightly acid; clear, smooth boundary. 10 to 18 inches thick.

B3--17 to 32 inches, brown (10YR 4/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; massive; soft, very friable, nonsticky, nonplastic; many roots; medium acid; clear, wavy boundary. 8 to 18 inches thick.

IIC--32 to 60 inches, black and dark grayish-brown (10YR 2/1 and 4/2) very gravelly coarse sand, gray, grayish brown, and brown (10YR 5/1 and 5/3) dry; single grain; loose, nonsticky, nonplastic; few roots; medium acid.

The A horizon ranges from black to dark gray. The B1r horizon ranges from dark brown and brown to dark yellowish brown and the B3 horizon from brown to dark brown. The IIC horizon ranges from black and very dark brown to olive brown, and from very

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gravelly coarse sand to very gravelly loamy sand. Depth to the IIC horizon ranges from 18 to 36 inches.

Some areas are up to 5 percent included Alderwood soils, on the more rolling and undulating parts of the landscape; some are about 5 percent the deep, sandy Indianola soils; and some are up to 25 percent Neilton very gravelly loamy sands. Also included in mapping are areas where consolidated glacial till, which characteristically underlies Alderwood soils, is at a depth of 5 to 15 feet.

Permeability is rapid. The effective rooting depth is 60 inches or more. Available water capacity is low. Runoff is slow, and the erosion hazard is slight.

This soil is used for timber and pasture and for urban development. Capability unit IVs-1; woodland group 3f3.

Everett gravelly sandy loam, 5 to 15 percent slopes (EvC).--This soil is rolling. Areas are irregular in shape, have a convex surface, and range from 25 acres to more than 200 acres in size. Runoff is slow to medium, and the erosion hazard is slight to moderate.

Soils included with this soil in mapping make up no more than 25 percent of the total acreage. Some areas are up to 5 percent Alderwood soils, which overlie consolidated glacial till; some are up to 20 percent Neilton very gravelly loamy sand; and some are about 15 percent included areas of Everett soils where slopes are more gentle than 5 percent and where they are steeper than 15 percent.

This Everett soil is used for timber and pasture and for urban development. Capability unit VIs-1; woodland group 3f3.

Everett gravelly sandy loam, 15 to 30 percent slopes (EvD).--This soil occurs as long, narrow areas, mostly along drainageways or on short slopes between terrace benches. It is similar to Everett gravelly sandy loam, 0 to 5 percent slopes, but in most places is stonier and more gravelly.

Soils included with this soil in mapping make up no more than 30 percent of the total acreage. Some areas are up to 10 percent Alderwood soils, which overlie consolidated glacial till; some are up to 5 percent the deep, sandy Indianola soils; some are up to 10 percent Neilton very gravelly loamy sand; and some are about 15 percent included areas of Everett soils where slopes are less than 15 percent.

Runoff is medium to rapid, and the erosion hazard is moderate to severe.

Most of the acreage is used for timber. Capability unit VIe-1; woodland group 3f2.

Everett-Alderwood gravelly sandy loams, 6 to 15 percent slopes (EwC).--This mapping unit is about equal parts Everett and Alderwood soils. The soils are rolling. Slopes are dominantly 6 to 10 percent, but range from gentle to steep. Most areas are irregular in shape and range from 15 to 100 acres or more in size. In areas classified as Everett soils, field examination and geologic maps indicate the presence of a consolidated substratum at a of 7 to 20 feet. This substratum is the same rial as that in the Alderwood soils.

Some areas are up to 5 percent included No Seattle, and Tukwila soils, all of which are p drained.

Runoff is slow to medium, and the erosion h is slight to moderate.

Most of the acreage is used for timber. Ca ity unit VIs-1; woodland group 3f3.

Indianola Series

The Indianola series is made up of somewhat excessively drained soils that formed under co in sandy, recessional, stratified glacial drif These undulating, rolling, and hummocky soils terraces. Slopes are 0 to 30 percent. The ar precipitation is 30 to 55 inches, and the mean annual air temperature is about 50° F. The fr free season is 150 to 210 days. Elevation ran from about sea level to 1,000 feet.

In a representative profile, the upper 30 i is brown, dark yellowish-brown, and light oliv brown loamy fine sand. This is underlain by c sand that extends to a depth of 60 inches or m (pl. I, right).

Indianola soils are used for timber and for development.

Indianola loamy fine sand, 4 to 15 percent (InC).--This undulating and rolling soil has c slopes. It is near the edges of upland terrac Areas range from 5 to more than 100 acres in s

Representative profile of Indianola loamy f sand, 4 to 15 percent slopes, in forest, 1,000 west and 900 feet south of the northeast corne sec. 32, T. 25 N., R. 6 E.:

O1--3/4 inch to 0, leaf litter.

B21ir--0 to 6 inches, brown (10YR 4/3) loamy f sand, brown (10YR 5/3) dry; massive; sof very friable, nonsticky, nonplastic; man roots; slightly acid; clear, smooth boun 4 to 8 inches thick.

B22ir--6 to 15 inches, dark yellowish-brown (1 4/4) loamy fine sand, brown (10YR 5/3) d massive; soft, very friable, nonsticky, plastic; common roots; slightly acid; cl smooth boundary. 6 to 15 inches thick.

C1--15 to 30 inches, light olive-brown (2.5Y 5, loamy fine sand, yellowish brown (10YR 6, dry; massive; soft, very friable, nonsti nonplastic; common roots; slightly acid; gradual, smooth boundary. 12 to 17 inch thick.

C2--30 to 60 inches, olive (5Y 5/4) sand, light brownish gray (2.5Y 6/2) dry; single grai loose, nonsticky, nonplastic; few roots; slightly acid. Many feet thick.

There is a thin, very dark brown A1 horizon the surface in some places. The B horizon ran

ENCLOSURE 8