

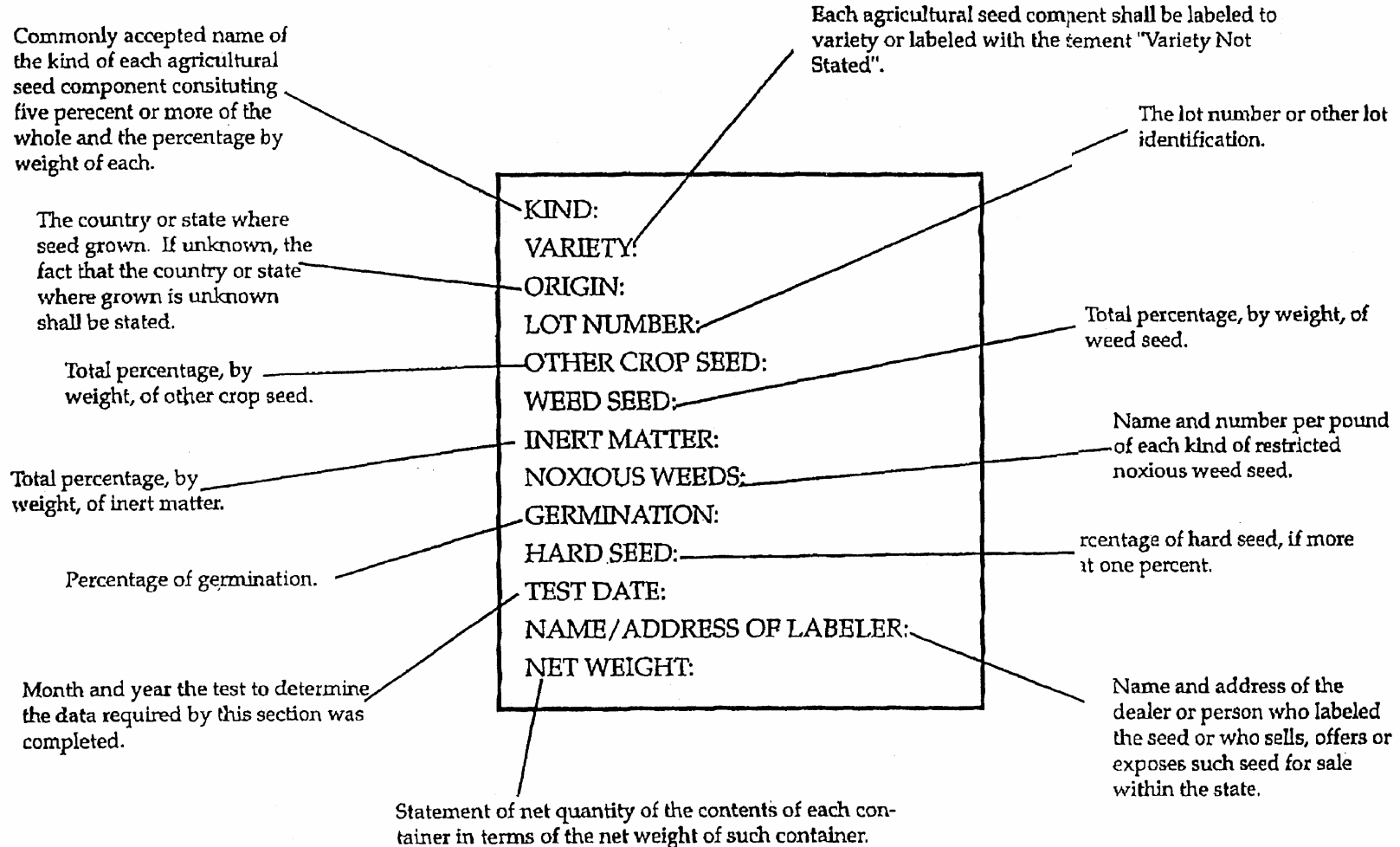
APPENDIX D
Rules of Thumb

Rules of Thumb

Several Rules of Thumb worksheets are provided to aid designers and inspectors in determining and verifying the quality and quantity of various erosion control items. These are especially useful when verifying the application rates of various mulch and hydraulically applied products. Rules of Thumb includes the following:

- Example Seed Tags
- Slope Inclination Conversions
- Metric Conversions
- Sediment Trap Sizing Spreadsheet
- I-D-R Curve Zone Map
- Straw Mulch Application Worksheet
- Hydraulic Application Equations
- Wood Fiber Mulch Hydraulic Application Worksheet
- Seed / Fertilizer Hydraulic Application Worksheet
- Hydraulic Application Example Problems

SEED LABEL REQUIREMENTS



Note: For further information of labeling of seed for turf type purposes or for feed, please see a copy of ORChapter 633 (Appendix 1).

Label Examples

Example 1:

HIGHWAY MIX			
KIND: Orchardgrass		LOT NO: XX-X-XXX	
VARIETY: BY1			
PURE SEED:	93.64%	ORIGIN:	OR
OTHER CROP:	0.14%		
INERT MATTER:	6.22%	GERM:	88%
WEED SEED:	0.00%	HARD SEED:	0%
NOXIOUS WEED SEED:	45 Daucas Carota/lb.	TOTAL:	88%
BAG SIZE:	50 lbs	TEST DATE:	3/94
AMA-137			
ABC SEEDS		ANYTOWN, MO.	

Example 2:

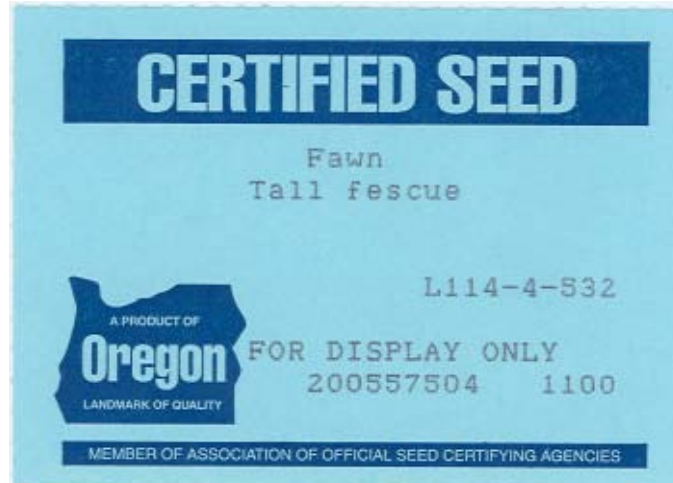
NEWPORT KENTUCKY BLUEGRASS	
LOT NO. XX111	
PURE SEED	97.91%
CROP SEED	0.00%
INERT MATTER	1.98%
WEED SEED	0.11%
GERMINATION	85%
LOT NO.	XX111
NET WT.	50 LBS
ORIGIN	ID
TESTED	08/93
AMS	667
ABC COMPANY	ANYTOWN, OR

Example 3:

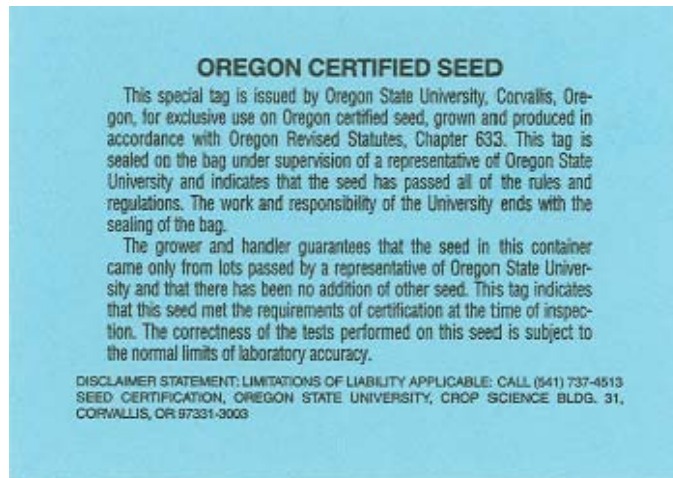
TO: XYZ ANYTOWN, OREGON						
MIX NAME: DAYVILLE #1 MIX			LOT: XX1-111			
	LBS/ACRE	KIND	PURE SEED IN MIX	GERM	PURITY	ORIGIN
1)	400.0 LB	LUNA PUBESCENT WHEATGRASS	6.20%	91.00%	94.96%	ID
2)	200.0 LB	CEREAL RYE	3.26%	86.00%	99.84%	CAN
3)	1275.0 LB	SECTAR BLUEBUNCH WHEATGRASS	20.52%	89.00%	98.59%	WA
4)	1850.0 LB	PAIUTE ORCHARDGRASS	29.09%	96.00%	96.29%	OR
5)	880.0 LB	JOSEPH IDAHO FESCUE	11.06%	91.00%	84.67%	ID
6)	800.0 LB	SMALL BURNETT	12.89%	86.00%	98.67%	OR
7)	800.0 LB	FAIRWAY CRESTED WHEATGRASS	12.84%	90.00%	98.29%	CAN
OTHER CROP SEED:		0.11%	INERT MATTER:	4.81%	WEEDS:	0.02%
BAG WEIGHT:		50 LBS NET	DATE OF TEST: 06/01/94			
NOXIOUS: NONE FOUND						
PO NUMBER: 1111XX111-X1-1111						
ABC COMPANY, ANYTOWN, WASHINGTON						

OREGON CERTIFIED SEED TAG SAMPLE

(Front)




(Back)



WASHINGTON CERTIFIED SEED TAG SAMPLE

(Front)

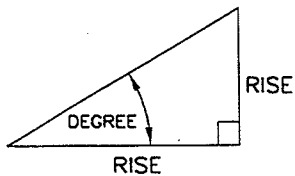
CERTIFIED SEED	
AGR 651-4651 (R/1/02)	
SEED PROGRAM DEPT. OF AGRICULTURE YAKIMA, WASHINGTON	"VARIETY NAME" RED FESCUE
	LOT NO: 3-11-05
	OFFICIAL LABEL NO: 2322268
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES	

(Back)

OFFICIAL TAG
Handler or shipper is responsible for labeling to conform with State and Federal Seed Law. The Washington State Department of Agriculture warrants that this seed has been produced and conditioned according to certification rules and regulations promulgated under SEEDS, Chapter 15.49 RCW and WAC 16-302-115.
WASHINGTON CERTIFIED SEED
Purchaser wishing to plant this seed for re-certification should investigate its eligibility. For information, contact the Seed Program, State Department of Agriculture, Yakima, Washington 98902.

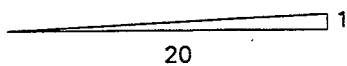
SLOPE INCLINATION CONVERSION WORKSHEET

RISE	RUN	RATIO	PERCENT	DEGREE
1	20	1:20	5.0	2.86
1	10	1:10	10.0	5.71
1	9	1:9	11.1	6.34
1	8	1:8	12.5	7.12
1	7	1:7	14.3	8.13
1	6	1:6	16.67	9.46
1	5	1:5	20	11.31
1	4	1:4	25	14.04
1	3	1:3	33.3	18.43
1	2	1:2	50	26.57
1	1.5	1:1.5	66.67	33.69
1	1.25	1:1.25	87	38.66
1	1	1:1	100	45
1	0.75	1:0.75	133.33	53.13
1	0.50	1:0.50	200	63.43
1	0.25	1:0.25	400	75.96

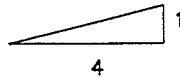


$$\text{SLOPE} = \frac{\text{RISE}}{\text{RUN}}$$

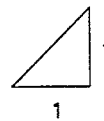
EXAMPLE



20
1:20
5%
2.86°



4
1:4
25%
14.04°



1
1:1
100%
45°



0.25
1:0.25
400%
75.96°

HARZA
Engineering Company

425 Roland Way.
Oakland, California. 94621
Tel: (510)568-4001 - Fax:(510)568-2205

DESIGN BY: ROC
CHECKED BY: JB
APP'D BY: JB
SCALE: NO SCALE
DATE: 03JAN99
DWG FILE: 7260E.01

SLOPE CONVERSION WORKSHEET

ODOT EROSION
CONTROL MANUAL

FIGURE

1

PROJECT No.

7260-E

Measurement in:	From English Units:	To Metric Units:	Multiply By:
LENGTH	inch (in)	millimeter (mm)	25.40
	foot (ft)	meter (m)	0.3048
	yard (yd)	meter (m)	0.9144
	mile (mi)	kilometer (km)	1.609
AREA	in ²	mm ²	645.2
	ft ²	m ²	0.0929
	yd ²	m ²	0.8361
	mi ²	km ²	2.590
	acre	hectare (ha)	0.4047
	acre	in ²	4047

Familiar Conversions to Metric Units:

LENGTH	Thickness of a Dime	1 mm
	Diameter of a ballpoint pen	10 mm
	Length of a- paper clip	30 mm
	Length of a dollar bill	150 mm
	Height of a Door	2 m
	Length of a football field	100 m
	Width of a piece of paper	85 mm
WEIGHT	Large paper clip	1 gram (g)
	Nickel	5 g
	Large Apple	50 g
	Size "D" Battery	100 g
	Large Can of Tomatoes	1 kilogram (kg)
TEMPERATURE	Water Freezes	0 degrees Celcius (° C)
	Body Temperature	37° C
	Water Boils	100° C

*Reference: Metric Basics. 1994. Oregon Department of Transportation, Project Services.

Some Common Metric Abbreviations

Mgn/ha/year	=	megagram per hectare per year
L	=	liter
ha	=	hectares
kg	=	kilogram = 1 x 10 ³ grams
m	=	meter
km	=	kilometer = 1 x 10 ³ meters
mm	=	millimeter
Mgqn	=	megagram = 1 x 10 ⁶ grams
kN/m ³	=	kiloNewtons per cubic meter
Pa	=	Pascal

METRIC CONVERSION FACTORS

Quanti	From SI Units	To English Units	Divided B
Length	km	mile	1.609
	m	yard	0.9144
	m	foot	0.3048
	mm	inch	25.4
Area	km ²	square mile	2.59
	m ²	acre	4047
	hectare	acre	0.404
	m ²	square yard	0.836
	m ²	square foot	0.092
	mm ²	square inch	645.2
Volume	m ³	acre foot	1233
	m ³	cubic yard	0.764
	m ³	cubic foot	0.028
	L(1000 cm ³)	cubic foot	28.32
	m ³	1000 board feet	2.36
	L(1000 em ³)	gallon	3.785
	cm ³	cubic inch	16.39
Mass	kg	pound mass lb.-mass, 1 bn,	0.4536
Mass Density	kg/m ³	lb.-mass/ft	16.02
Force	N	lb.	4.448
	kN	kip	4.448
Force/Unit Length	N/m	lbs/ft	14.59
	kN/m	kips/ft	14.59
Force/Unit Area, Pressure Stress, Modulus of Elasticity	kPa	lbs/in ²	6.895
	MPa	kips/in ²	6.895
	Pa	lbs/ft ²	47.88
	kPa	ki s/ft ²	47.88
Force/Volume Unit Weight	N/m ³	lbs/ft ³	157.1
	kN/m ³	ki s/ft ³	157.1
Bending Moment, Torque Moment of Force	kN-m	ft-lb	1.356
		ft-kip	1.356
Work	Nm	lb-ft	1.355818
Energy	Joules	ft-lb	1.355818
Volume Rate of Flow	in ³ /S	ft ³	0.02832
	in ³ /S	cfin	0.000472
	L/s	c fm	0.4719
	in ³ /S	m d	0.0438
Temperature	°C	°F	(°F-32°)/1.8
Velocity, Seed	m/s	ft/s	0.3048
Acceleration	m/s ²	ft/s ²	0.3048

Ref. FHWA Geotechnical Metrication Guidelines

* Underline denotes exact conversion

Sediment Trap Sizing

Job Name	
Key #	
Designer	
Location	Station:

Zone	A	L	W	L/W	D	X	Z
4	0.5	9	3	3.0	1.4	1.0	3
V (Req)		V (Calc) O.K.					
141.0		141.3					

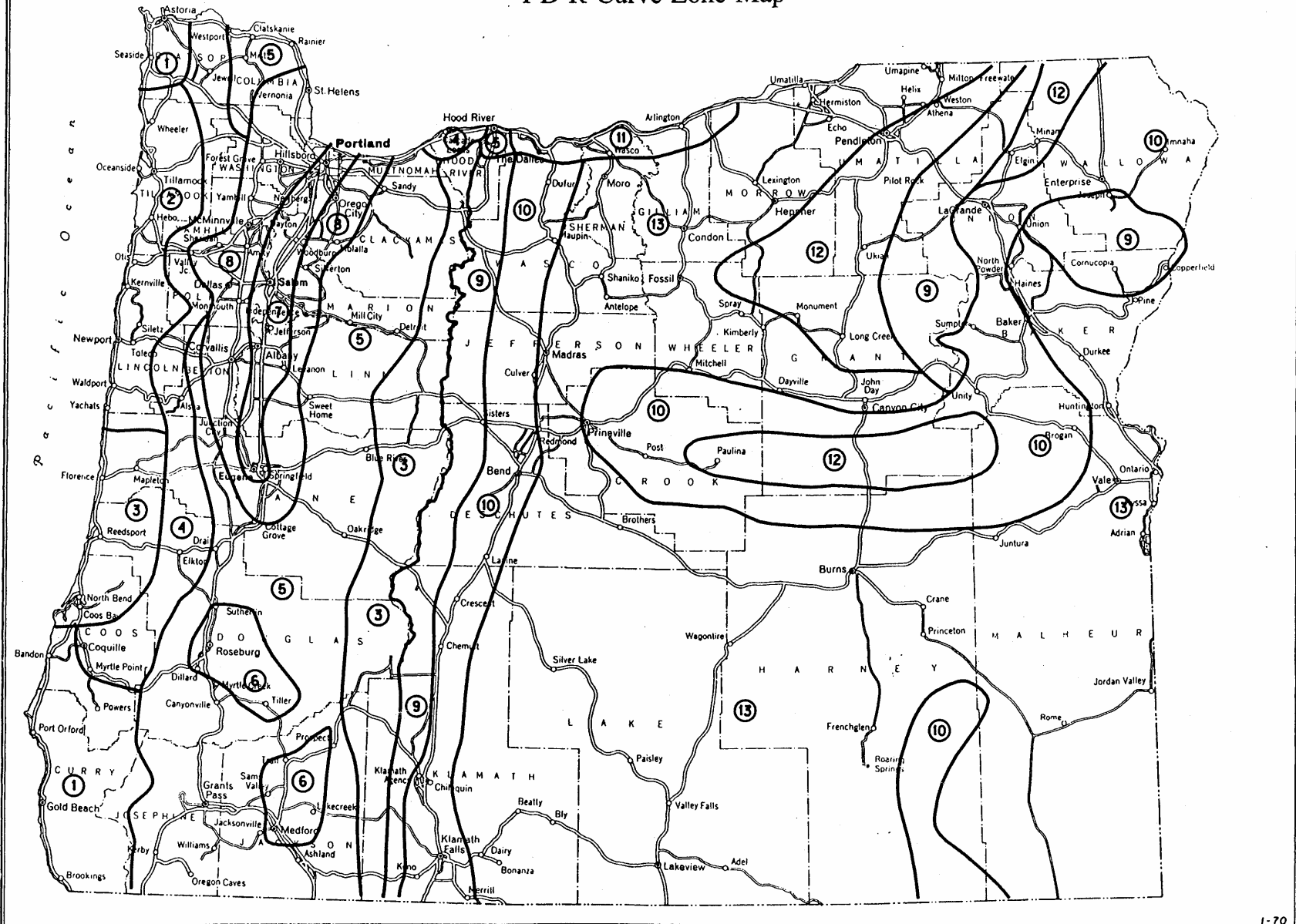
Wet Storage		Footprint		
D _w	V _w	L _{fp}	W _{fp}	A _{fp}
0.93	66.3	17.4	11.4	198.4

Recommended Limits			Limit Check
Variable	Min	Max	
A	N/A	2	<input checked="" type="checkbox"/>
V	25	500	<input checked="" type="checkbox"/>
D	1.1	1.5	<input checked="" type="checkbox"/>
L	3	N/A	<input checked="" type="checkbox"/>
W	1	N/A	<input checked="" type="checkbox"/>
L/W	2	N/A	<input checked="" type="checkbox"/>
Z	2	N/A	<input checked="" type="checkbox"/>
X	1	N/A	<input checked="" type="checkbox"/>

Variable Descriptions

Zone	Rainfall Zone as Described in ODOT Hydraulics Manual	
A	Contributing Drainage Area to Trap (ha)	
L	Length of trap, measured along the bottom (m)	Wet Storage
W	Width of trap, measured along the bottom (m)	Portion of trap designed to retain water
L/W	Length to Width Ratio	D_w
D	Depth of trap from bottom to weir (m)	Depth of wet storage in trap (m)
X	Length of Weir (m)	V_w
Z	Horizontal component of side slopes (i.e. 1:Z)	Volume of wet storage in trap (m ³)
V (Calc)	Storage Volume available in trap (m ³)	Footprint
V (Req)	Storage Volume required for site conditions (m ³)	Dimensions of site required to construct the trap.
		L_{fp}
		Length of footprint (m)
		W_{fp}
		Width of footprint (m)
		A_{fp}
		Area of footprint (m ²)

I-D-R Curve Zone Map



STRAW MULCH

APPLICATION RATE*		
4.5 M /Hectare	2 Ton/Acre	No. of Bales
Area = 1 Hectare		200
1000 Square Meters		20
100 Square Meters		2
Area = 1 Acre **		80
1000 Square Feet		2
6.7 M /Hectare	3 Ton/Acre	No. of Bales
Area = 1 Hectare		300
1000 Square Meters		30
100 Square Meters		3
Area = 1 Acre **		120
1000 Square Feet		3

* Bale weight varies from approximately 19 Kg to 27 Kg (40 lbs to 60 lbs).
 Chart based on approximately 23 Kg (50 lb average)

** 2.47 Acres = 1 Hectare

Hydraulic Application Equations

Wood Fiber Mulch Hydraulic Application

Average Water Required for Application

English: $V_{wa} \text{ (gal)} = (W_{wf}) / (40\text{lbs mulch} / 100\text{gal water})$

Metric: $V_{wa} \text{ (Liters)} = (W_{wf}) / (18\text{kg mulch} / 379\text{L water})$

Maximum Water Required for Application

English: $V_{wm} \text{ (gal)} = (W_{wf}) / (50\text{lbs mulch} / 100\text{gal water})$

Metric: $V_{wm} \text{ (Liters)} = (W_{wf}) / (23\text{kg mulch} / 379\text{L water})$

Area of Coverage

English: $A \text{ (acre)} = (W_{wf} / R_{wf})$

$$A \text{ (ft}^2\text{)} = (W_{wf} / R_{wf}) * (43,560 \text{ ft}^2\text{/acre)}$$

Metric: $A \text{ (ha)} = (W_{wf} / R_{wf}) / (1,000 \text{ kg/Mg})$

$$A \text{ (m}^2\text{)} = ((W_{wf} / R_{wf}) / (1,000 \text{ kg/Mg})) * (10,000 \text{ m}^2\text{/ha)}$$

Wood Fiber Application Rate (lb/acre) or (Mg/ha)	R_{wf}
Weight or Mass of Wood Fiber (lbs) or (kg)	W_{wf}
Average Water Requirement (gal) or (L)	V_{wa}
Maximum Water Requirement (gal) or (L)	V_{wm}
Area of Coverage (ft ²) & (acres) or (m ²) & (ha)	A

Seed or Fertilizer Hydraulic Application

Area of Coverage

English: $A \text{ (acre)} = (W_{sf} / R_{sf})$

$$A \text{ (ft}^2\text{)} = (W_{sf} / R_{sf}) * (43,560 \text{ ft}^2\text{/acre)}$$

Metric: $A \text{ (ha)} = (W_{sf} / R_{sf})$

$$A \text{ (m}^2\text{)} = ((W_{sf} / R_{sf}) * (10,000 \text{ m}^2\text{/ha}))$$

Seed or Fertilizer Application Rates (lb/acre) or (kg/ha)	R_{sf}
Weight or Mass of Seed or Fertilizer (lbs) or (kg)	W_{sf}
Area of Coverage (ft ²) & (acres) or (m ²) & (ha)	A

		Wood Fiber Mulch Hydraulic Application			
Table C-d		000 lb/acre Application Rate (R₀)			
Wood Fiber		Water Required for Application		Area of Coverage A	
(WA)		Average (V _{avg}) Maximum (V _{max})			
		400lb mulch / 100 gal water 500lb mulch / 100 gal water			
Pounds		*Gallons	*Gallons	ft	Acres
500		1,250	1,000	43,560	1.00
600		1,500	1,200	52,272	1.20
700		1,750	1,400	60,984	1.40
800		2,000	1,600	69,696	1.60
900		2,250	1,800	78,408	1.80
1,000		2,500	2,000	87,120	2.00
1,100		2,750	2,200	95,832	2.20
1,200		3,000	2,400	104,544	2.40
1,300		---	2,600	113,256	2.60
1,400		--	2,800	121,968	2.80
1,500		---	3,000	130,680	3.00
Table C-2d		000 lb/acre Application Rate (R₀)			
Wood Fiber		Water Required for Application		Area of Coverage A	
(V _{avg})		Average (V _{avg}) Maximum (V _{max})			
		400lb mulch / 100 gal water 500lb mulch / 100 gal water			
Pounds		*Gallons	*Gallons	ft	Acres
500		1,250	1,000	14,520	0.33
600		1,500	1,200	17,424	0.40
700		1,750	1,400	20,328	0.47
800		2,000	1,600	23,232	0.53
900		2,250	1,800	26,136	0.60
1,000		2,500 - 2,000		29,040	0.67
1,100		2,750	2,200	31,944	0.73
1,200		3,000	2,400	34,848	0.80
1,300		--	2,600	37,752	0.87
1,400		---	2,800	40,656	0.93
1,500		---	3,000	43,560	1.00
*		Largest Typical HD raised bed implement has a 3,000 gallon tank			

		Wood Fiber Mulch Hydraulic Application			
Table C-		0001b/acre Application Rate (R,,f)			
Wood Fiber		Water Required for Application		Area of Coverage A	
(WM)		Average (V,,,,) Maximum (Vw,,)			
		401bs mulch / 100 al water 501bs mulch / 100 al water			
Pounds		*Gallons *Gallons		ft z Acres	
500		1,250 1,000		10,890 0.25	
600		1,500 1,200		13,068 0.30	
700		1, 750 1,400		15,246 0.35	
800		2,000 1,600		17,424 0.40	
900		2,250 1,800		19,602 0.45	
1,000		2,500 2,000		21,780 0.50	
1,100		2, 750 2,200		23,958 0.55	
1,200		3,000 2,400		26,136 0.60	
1,300		-2,600		28,314 0.65	
1,400		-- 2,800		30,492 0.70	
1,500		-3,000		32,670 0.75	
Table C-4		5001b/acre Application Rate (R,,,, r)			
Wood Fiber		Water Required for A lication		Area of Covera e A	
(WA		Average (V,,,,) Maximum (Vw,,)			
		401bs mulch / 100 al water 501bs mulch / 100 al water			
Pounds		*Gallons *Gallons		ft 2 Acres	
500		1,250 1,000		8,712 0.20	
600		1,50 0 1,2 00		10,454 0.24	
700		1, 75 0 1,400		12,197 0.28	
800		2,000 1,600		13,939 0.32	
900		2,250 1,800		15,682 0.36	
1000		2,500 2,000		17,424 0.40	
1,100		27502,200		19,166 0.44	
1,200		3,000 2,400		20,909 0.48	
1,300		-2,600		22,651 0.52	
1,400		- 2 800 -		24,394 0.56	
1,500		-3,000		26,136 0.60	
*		Largest Typical Hydro seeding equipment has a 3,000 gallon working		volume.	

Table D-1,		Wood Fiber Mulch Hydraulic Application			
		.56Mg/ha Application Rate (R_{wf})			
Wood Fiber	Water Required for Application				Area of Coverage
(W _f)	Average (V _{avg}) Maximum (V _w)				
	18k mulch / 379L water 23k mulch / 379L water				
Kilograms	*Liters	*Liters	m ²	Hectare	
200	4,168	3,335	3,567		0.36
250	5,211	4,169	4,459		0.45
300	6,253	5,003	5,351		0.54
350	7,295	5,836	6,243		0.62
400	8,337	6,670	7,135		0.71
450	9,379	7,504	8,027		0.80
500	10,421	8,338	8,918		0.89
545	11,356	9,088	9,721		0.97
550	-9,171		9,810		0.98
600	-10,005		10,702		1.07
650	-10,839		11,594		1.16
681	-11,356		12,147		1.21
Table D-2,		.7Mg/ha Application Rate (R_r)			
		Water Required for Application		Area of Coverage	
Wood Fiber	Average (V _a) Maximum (V _v)				
(W _a)	18k mulch/ 379L water 23k mulch / 379L water				
Kilograms	*Liters	*Liters	m ²	Hectare	
200	4,168	3,335	1,189		0.12
250	5,211	4,169	1,486		0.15
300	6,253	5,003	1,784		0.18
350	7,295	5,836	2,081		0.21
400	8,337	6,670	2,378		0.24
450	9,379	7,504	2,675		0.27
500	10,421	8,338	2,973		0.30
545	11,356	9,088	3,240		0.32
550	-9,171		3,270		0.33
600	-10,005		3,567		0.36
650	-10,839		3,865		0.39
681	-11,356		4,049		0.40
Largest Typical Hydro seeding equipment has a 11,356 liter working			volume.		

Wood Fiber Mulch Hydraulic Application				
Table D-	. Mg/ha Application Rate (Rwf)			
Wood Fiber	Water Required for Application			Area of Coverage
(W,,lf)	Average (V,,,,) Maximum (V,,,,)			
	18k mulch / 379L water 23k mulch / 379L water			
Kilograms	*Liters	*Liters	m	Hectare
200	4,168	3,335	892-	0.09
250	5,211	4,169	1,115	0.11
300	6,253	5,003	1,338	0.13
350	7,295	5,836	1,561	0.16
400	8,337	6,670	1,784	0.18
450	9,379	7,504	2,007	0.20
500	10,421	8,338	2,230	0.22
545	11,356	9,088	2,430	0.24
550	-9171		2,453	0.25
600	-10,005		2,675	0.27
650	-10,839		2,898	0.29
681	-11,356		3,037	0.30
Table D-4	.8Mg/ha Application Rate (R,,f)			
Wood Fiber	Water Required for Application			Area of Coverage
(WA	Average (V,,,,a) Maximum (V,,,,)			
	18k mulch I 379L water 23k mulch I 379L water			
Kilograms	*Liters	*Liters	m	Hectare
200	4,168	3,335	713	0.07
250	5,211	4,169	892	0.09
300	6,253	5,003	1,070	0.11
350	7,295	5,836	1,249	0.12
400	8,337	6,670	1,427	0.14
450	9,379	7,504	1,605	0.16
500	10,421	8,338	1,784	0.18
545	11,356	9,088	1,944	0.19
550	-9,171		1,962	0.20
600	-10,005		2,140	0.21
650	-10,839		2,319	0.23
681	-11,356		2,429	0.24
Largest Typical Hydro seeding equipment has a 11,356 liter working volume.				

**Table A-1
Seed or Fertilizer Hydraulic Application**

Application Rate (W _{sf})	Area of Coverage (A)													
	Application Rates of Pure Live Seed (R _{sf})													
	20 lb/ac		40 lb/ac		60 lb/ac		80 lb/ac		100 lb/ac		200 lb/ac		400 lb/ac	
	acres	ft ²	acres	ft ²	acres	ft ²	acres	ft ²	acres	ft ²	acres	ft ²	acres	ft ²
10	0.50	21,000	0.25	10,900	0.17	7,260	0.13	5,445	0.10	4,356	0.05	2,178	0.03	1,090
20	1.00	43,560	0.50	21,780	0.33	14,520	0.25	10,900	0.20	8,712	0.10	4,356	0.05	2,178
30	1.50	65,340	0.75	32,670	0.50	21,780	0.38	16,335	0.30	13,068	0.15	6,534	0.08	3,267
40	2.00	87,120	1.00	43,560	0.67	29,040	0.50	21,780	0.40	17,424	0.20	8,712	0.10	4,356
50	2.50	108,900	1.25	54,450	0.83	36,300	0.63	27,225	0.50	21,780	0.25	10,900	0.13	5,445
60	3.00	130,680	1.50	65,340	1.00	43,560	0.75	32,670	0.60	26,136	0.30	13,068	0.15	6,534
70	3.50	152,460	1.75	76,230	1.17	50,220	0.88	37,115	0.70	30,492	0.35	15,246	0.18	7,623
80	4.00	174,240	2.00	87,120	1.33	58,080	1.00	43,560	0.80	34,464	0.40	17,424	0.20	8,712
90	4.50	196,020	2.25	98,010	1.50	65,340	1.13	49,005	0.90	39,204	0.45	19,602	0.23	9,801
100	5.00	217,800	2.50	108,900	1.67	72,600	1.25	54,450	1.00	43,560	0.50	21,780	0.25	10,900
120	6.00	261,360	3.00	130,680	2.00	87,120	1.50	65,340	1.20	52,224	0.60	26,136	0.30	13,068
140	7.00	304,920	3.50	152,460	2.33	101,640	1.75	76,230	1.40	60,944	0.70	30,492	0.35	15,246
160	8.00	348,480	4.00	174,240	2.67	116,160	2.00	87,120	1.60	69,696	0.80	34,848	0.40	17,424
180	9.00	392,040	4.50	196,020	3.00	130,680	2.25	98,010	1.80	78,440	0.90	39,204	0.45	19,602
200	10.00	435,600	5.00	217,800	3.33	145,200	2.50	108,900	2.00	87,120	1.00	43,560	0.50	21,780
220	11.00	479,160	5.50	239,580	3.67	159,240	2.75	119,925	2.20	95,328	1.10	47,916	0.55	23,958
240	12.00	522,720	6.00	261,360	4.00	174,240	3.00	130,680	2.40	104,544	1.20	52,224	0.60	26,136
260	13.00	566,280	6.50	283,140	4.33	188,280	3.25	141,562	2.60	113,256	1.30	56,628	0.65	28,314
280	14.00	609,840	7.00	304,920	4.67	202,320	3.50	152,460	2.80	121,968	1.40	60,944	0.70	30,492
300	15.00	653,400	7.50	326,700	5.00	217,800	3.75	163,350	3.00	130,680	1.50	65,340	0.75	32,670

"Application Rate" is Pure Live Seed

Gross weight of seed can be converted by the Pure Live Seed (PLS) Rate $[\%Purity \times \%Germination] = \%PLS$; $W_{sf} = Gross\ Weight \times \%PLS$

To evaluate mulch tracer material, use Table A-1.

Table B-1														
Application Load		Seed or Fertilizer Hydraulic				Application								
Application Load		Area of Coverage (A)												
Application Load		Application Rate of Pure Live Seed (R _{sf})												
(W _{sf})	22 kg/ha		44 kg/ha		67 kg/ha		112 kg/ha		22 kg/ha		2 kg/CaC		4 kg/ha	
KilogramC	aC	m ^{2C}	aC	m ^{2C}	aC	m ^{2C}	aC	m ^{2C}	aC	m ^{2C}	aC	m ^{2C}	aC	m ^{2C}
5C	0.23C	2,273C	0.11C	1,136C	0.07C	746C	0.04C	446C	0.02C	222C	0.02C	200C	0.01C	111C
10C	0.45C	4,545C	0.23C	2,273C	0.15C	1,493C	0.09C	893C	0.04C	444C	0.04C	400C	0.02C	222C
15C	0.68C	6,818C	0.34C	3,409C	0.22C	2,239C	0.13C	1,339C	0.07C	667C	0.06C	600C	0.03C	333C
20C	0.91C	9,091C	0.45C	4,545C	0.30C	2,985C	0.18C	1,786C	0.09C	889C	0.08C	800C	0.04C	444C
25C	1.14C	11,364C	0.57C	5,682C	0.37C	3,731C	0.22C	2,232C	0.11C	1,111C	0.10C	1,000C	0.06C	556C
30C	1.36C	13,636C	0.68C	6,818C	0.45C	4,478C	0.27C	2,679C	0.13C	1,333C	0.12C	1,200C	0.07C	667C
35C	1.59C	15,909C	0.80C	7,955C	0.52C	5,224C	0.31C	3,125C	0.16C	1,556C	0.14C	1,400C	0.08C	778C
40C	1.82C	18,182C	0.91C	9,091C	0.60C	5,970C	0.36C	3,571C	0.18C	1,778C	0.16C	1,600C	0.09C	889C
45C	2.05C	20,455C	1.02C	10,227C	0.67C	6,171C	0.40C	4,018C	0.20C	2,000C	0.18C	1,800C	0.10C	1,000C
50C	2.27C	22,727C	1.14C	11,364C	0.75C	7,463C	0.45C	4,464C	0.22C	2,222C	0.20C	2,000C	0.11C	1,111C
60C	2.73C	27,273C	1.36C	13,636C	0.90C	8,955C	0.54C	5,357C	0.27C	2,667C	0.24C	2,400C	0.13C	1,333C
70C	3.18C	31,818C	1.59C	15,909C	1.04C	10,448C	0.63C	6,250C	0.31C	3,111C	0.28C	2,800C	0.16C	1,556C
80C	3.64C	36,364C	1.82C	18,182C	1.19C	11,940C	0.71C	7,143C	0.36C	3,556C	0.32C	3,200C	0.18C	1,778C
90C	4.09C	40,909C	2.05C	20,455C	1.34C	13,433C	0.80C	8,036C	0.40C	4,000C	0.36C	3,600C	0.20C	2,000C
100C	4.55C	45,455C	2.27C	22,727C	1.49C	14,925C	0.89C	8,929C	0.44C	4,444	0.40C	4,000C	0.22C	2,222C
110C	5.00C	50,000C	2.50C	25,000C	1.64C	16,418C	0.98C	9,821C	0.49C	4,889C	0.44C	4,400C	0.24C	2,444C
120C	5.45C	54,545C	2.73C	27,273C	1.79C	17,910C	1.07C	10,714C	0.53C	5,333C	0.48C	4,800C	0.27C	2,667C
130C	5.91C	59,091C	2.95C	29,545C	1.94C	19,403C	1.16C	11,607C	0.58C	5,778C	0.52C	5,200C	0.29C	2,889C
140C	6.36C	63,636C	3.18C	31,818C	2.09C	20,896C	1.25C	12,500C	0.62C	6,222C	0.56C	5,600C	0.31C	3,111C
150C	6.82C	68,182C	3.41C	34,091C	2.24C	22,388C	1.34C	13,393C	0.67C	6,667C	0.60C	6,000C	0.33C	3,333C

Application Load is in Pure Live Seed.

Gross weight of seed can be converted by the Pure Live Seed (PLS) Rate [%Purity x %Germination = %PLS ; W_{sf} =Gross Weight x %PLS]

To evaluate mulC tracer material, uCe Table C-1.C

Hydraulic Application Example Problems (English Units)

Example #1 (Mulch - Area of Coverage)

Given: Required mulch application rate 2,000 lb/acre.
Hydro Seeder with 1,800 gal working capacity.
900 lbs of Wood Fiber to be applied over seeded area.

Find: Range of Area of Coverage.

Answer: Find the 2,000 lb/acre Application Rate Chart, Table C-3.

Using a 50 lbs / 100 gal mulch/water ratio:

Find 1,800 gal in the Maximum Water Required for Application column.

Follow this row over to the area columns.

One tank can cover **0.45 acre (19,602 ft²)**.

Using a 40 lbs / 100 gal mulch/water ratio:

Find 1,800 gal in the Average Water Required for Application column.

There isn't an 1,800 gal row, so interpolate between 1,750 gal and 2,000 gal.

Follow the 1,750 gal and 2,000 gal row over to the area columns.

At 1,750 gal, one tank can cover 0.35 acre (15,246 ft²).

At 2,000 gal, one tank can cover 0.40 acre (17,424 ft²).

One tank can cover $1,800 \text{ lb} * ((0.40 \text{ acre} - 0.35 \text{ acre}) / (2,000 \text{ gal} - 1,750 \text{ gal}))$

0.36 acre (15,682 ft²).

Example #2 (Mulch - Materials Used)

Given: 0.80 acre (34,848 ft²) area to be seeded.
Required mulch application rate 1,500 lb/acre.
Hydro Seeder with 2,500 gal working capacity.

Find: A) Amount of Mulch Required in lbs.
B) Range of Water Required in gal.
C) Number of Trips Required.

Answer: Find the 1,500 lb/acre Application Rate Chart, Table C-2.

A) Find 0.80 acre under the Area of Coverage column.

Follow the row over to the Wood Fiber column.

The wood fiber required by the area is **1,200 lb**.

B) Find 0.80 acre under the Area of Coverage column.

Follow the row to the Required Water for Application column.

Using a 50 lbs / 100 gal mulch/water ratio:

The water required for the area is **2,400 gal**.

Using a 40 lbs / 100 gal mulch/water ratio:

The water required for the area is **3,000 gal**.

C) Using a 50 lbs / 100 gal mulch/water ratio:

$(2,400 \text{ gal} / (2,500 \text{ gal/trip})) =$ **1 trip**.

Using a 40 lbs / 100 gal mulch/water ratio:

$(3,000 \text{ gal} / (2,500 \text{ gal/trip})) = 1.2 \text{ trips}$, so use **2 trips**.

Hydraulic Application Example Problems (English Units)

Example #3 (Seed - Area of Coverage)

Given: Seed Application Rate 40 lb/acre.
200 lb of Seed is to be Applied.

Find: Area of Coverage.

Answer: Use the Seed or Fertilizer Hydraulic Application Chart, Table A-1.
Find the 40 lb/acre application rate column.
Find the 200 lb seed row.
Determine where the column and the row intersect and record the area.
For 40 lb/acre, the area of coverage is **5 acre (217,800 ft²)**.

or

Use the Formula on the Hydraulic Application Equations Sheet.
Find the area of coverage equation under the title Seed or Fertilizer Hydraulic Application.
The english unit, area equation is $A \text{ (acre)} = W_{sf} / R_{sf}$
 $\text{Area (acre)} = (200 \text{ lb}) / (40 \text{ lb/acre}) = \mathbf{5 \text{ acre.}}$
 $\text{Area (ft}^2\text{)} = [(200 \text{ lb}) / (40 \text{ lb/acre})] * (43,560 \text{ ft}^2\text{/acre)} = \mathbf{217,800 \text{ ft}^2}$.

Example #4 (Seed - Materials Needed)

Given: Required Area of Coverage .13 acre (5,662.8 ft²).
Seed Application Rate 200 lb/acre.

Find: Amount of Seed Required in lbs.

Answer: Use the Seed or Fertilizer Hydraulic Application Chart, Table A-1.
Find the 200 lb/acre application rate column.
Move down the list of areas to 0.13 acre.
0.13 acre is not in this column, so interpolate.
Find the area above and below 0.13 acre.
Follow the row from the area to the Amount of Seed column.
For 0.10 acre (4,356 ft²), the amount of seed is **20 lbs.**
For 0.15 acre (6,534 ft²), the amount of seed is **30 lbs.**
At 0.13 acre (5,662.8 ft²), the amount of seed is
 $0.13 \text{ acre} * ((30 \text{ lb} - 20 \text{ lb}) / (0.15 \text{ acre} - 0.10 \text{ acre})) = \mathbf{26 \text{ lbs.}}$

or

Use the Formula on the Hydraulic Application Equations Sheet.
Find the area of coverage equation under the title Seed or Fertilizer Hydraulic Application.
The english unit, area equation is $A \text{ (acre)} = W_{sf} / R_{sf}$
Rearrange the equation so $W_{sf} \text{ (lb)} = (A) * (R_{sf})$
 $W_{sf} \text{ (lb)} = (0.13 \text{ acre}) * (200 \text{ lb/acre}) = \mathbf{26 \text{ lbs.}}$

Hydraulic Application Example Problems

(Metric Units)

Example #1 (Mulch - Area of Coverage)

Given: Required mulch application rate 1.7 Mg/ha.
Hydro Seeder with 9,088 L working capacity.
545 kg of Wood Fiber to be applied over seeded area.

Find: Range of Area of Coverage.

Answer: Find the 1.7 Mg/ha Application Rate Chart, Table D-2.

Using a 23 kg / 379 L mulch/water ratio:

Find 9,088 L in the Maximum Water Required for Application column.
Follow this row over to the area columns.
One tank can cover **0.32 ha (3,240 m²)**.

Using a 18 kg / 379 L mulch/water ratio:

Find 9,088 L in the Average Water Required for Application column.
There isn't an 9,088 L row, so interpolate between 8,337 L and 9,379 L.
Follow the 8,337 L and 9,379 L row over to the area columns.
At 8,337 L, one tank can cover **0.24 ha (2,378 m²)**.
At 9,379 L, one tank can cover **0.27 ha (2,675 m²)**.
One tank can cover $9,088 \text{ L} * ((0.27 \text{ ha} - 0.24 \text{ ha}) / (9,379 \text{ L} - 8,337 \text{ L}))$
0.26 ha (2,617 m²).

Example #2 (Mulch - Materials Needed)

Given: 0.11 ha (1,070 m²) area to be seeded.
Required mulch application rate 2.8 Mg/ha.
Hydro Seeder with 6000 L working capacity.

Find: A) Amount of Mulch Required in kg.
B) Range of Water Required in L.
C) Number of Trips Required.

Answer: Find the 2.8 Mg/ha Application Rate Chart, Table D-4.

A) Find 0.11 ha under the Area of Coverage column.
Follow the row over to the Wood Fiber column.
The wood fiber required by the area is **300 kg**.

B) Find 0.11 ha under the Area of Coverage column.
Follow the row to the Required Water for Application column.

Using a 23 kg / 379 L mulch/water ratio:
The water required for the area is **5,003 L**.

Using a 18 kg / 379 L mulch/water ratio:
The water required for the area is **6,253 L**.

C) Using a 23 kg / 379 L mulch/water ratio:
 $(5,003 \text{ L} / (6,000 \text{ L/trip})) =$ **1 trip**.

Using a 18 kg / 379 L mulch/water ratio:
 $(6,253 \text{ L} / (6,000 \text{ L/trip})) = 1.04 \text{ trips}$, so use **2 trips**.

Hydraulic Application Example Problems (Metric Units)

Example #3 (Seed - Area of Coverage)

Given: Seed Application Rate 225 kg/ha.
10 kg of Seed is to be Applied.

Find: Area of Coverage.

Answer: Use the Seed or Fertilizer Hydraulic Application Chart, Table B-1.
Find the 225 kg/ha application rate column.
Find the 10 kg seed row.
Determine where the columns and the row intersect and record the areas.
For 225 kg/ha, the area of coverage is **0.04 ha (444 m²)**.

or

Use the Formula on the Hydraulic Application Equation Sheet.
Find the area of coverage equation under the title Seed or Fert. Hydraulic App.
The metric unit, area equation is $A \text{ (ha)} = W_{sf} / R_{sf}$.
 $\text{Area (ha)} = (10 \text{ kg}) / (225 \text{ kg/ha}) = 0.04 \text{ ha}$.
 $\text{Area (m}^2\text{)} = [(10 \text{ kg}) / (225 \text{ kg/ha})] * (10,000 \text{ m}^2\text{/ha)} = 444 \text{ m}^2$.

Example #4 (Seed - Materials Needed)

Given: Required Area of Coverage 1.55 ha (15,500 m²).
Seed Application Rate 44 kg/ha.

Find: Amount of Seed Required in kg.

Answer: Use the Seed or Fertilizer Hydraulic Application Chart, Table B-1.
Find the 44 kg/ha application rate column.
Move down the list of areas until 1.55 ha is found.
1.55 ha is not in this column, so interpolate.
Find the area above and below 1.55 ha.
Follow the row from the area to the Amount of Seed column.
For 1.36 ha (13,636 m²), the amount of seed is **60 kg**.
For 1.59 ha (15,909 m²), the amount of seed is **70 kg**.
At 1.55 ha (15,500 m²), the amount of seed is
 $1.55 \text{ ha} * ((70 \text{ kg} - 60 \text{ kg}) / (1.59 \text{ ha} - 1.36 \text{ ha})) = 67.4 \text{ kg}$, round to **68 kg**.

or

Use the Formula on the Hydraulic Application Equations Sheet.
Find the area of coverage equation under the title Seed or Fert. Hydraulic App.
The metric unit, area equation is $A \text{ (ha)} = W_{sf} / R_{sf}$.
Rearrange the equation so $W_{sf} \text{ (kg)} = (A) * (R_{sf})$.
 $W_{sf} \text{ (kg)} = (1.55 \text{ ha}) * (44 \text{ kg/ha}) = 68.2 \text{ kg}$.