APPENDIX B.

EROSION AND SEDIMENT CONTROL

GUIDELINES 2022

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The Community of Choice
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SECTION I. INTRODUCTION

1.1 OBJECTIVE

This document aims to:

Provide developers, consultants, and contractors a unified guidance of the City's expectations relating to Erosion and Sediment Control on Land Development projects.

1.2 BACKGROUND

Erosion – is the transport of soil particles by water, wind, or gravity, causing deterioration of the ground surface.

Sediment – is the soil particles suspended or settled in water typically at a lower ground elevation.

Silt – is fine soil particles of a size between sand and clay carried by water and deposited as sediment.

Erosion and Sediment Control – is eliminating, minimizing, and managing the causes and effects of erosion and sediment occurrence.

1.3 CITY DOCUMENTS

This guideline shall not in any way be utilized to dispute any text contained in other City documents. Related references are listed below.

- *Surface Drainage Bylaw C-1045-18*
- *Land Use Bylaw C-824-4*
- *Construction Site Cleanliness Bylaw C-976-16*
- *Traffic Bylaw C-1123-20*
- *Municipal Development Standards* as updated and/or amended

SECTION II. EROSION AND SEDIMENT CONTROL PLANS

ESC plans must be prepared and stamped by a Certified Professional in Erosion and Sediment Control (CPESC), or a Professional Agrologist (Pag), or a registered Professional Engineer (P. Eng).

In the case a pre-grading program is applied to the City through a Development Permit, ESC plans shall accompany the application accordingly.

As outlined on the City's Municipal Development Standards, plans must contain the following information.

2.1 Limits of soil disturbance

2.1.1. Development Boundaries

- Limit of proposed development stage
- Stripping outside of development
- Grading outside of development
- Size of stripping area in hectares

2.1.2. Idle Site Management

Once pre-stripped and/or pre-graded, a site will be considered idle if no Development Agreement application is received within two (2) construction seasons, including the season that the stripping and/or grading occurred. Idle site management shall be in place prior to the ground freezing and shall be in accordance with the minimum requirement as follows.

Overall size of land stripped	Idle Site Management Requirements
0 – 2 ha	Short-Term Cover or Water Management Plan
2 – 10 ha	Short-Term Cover and Water Management Plan
10+ ha	Long-Term Cover

Short-Term Cover – is a control that has a defined lifespan and must be reapplied or maintained. Examples include blankets, mulches, and tackifiers.

Long-Term Cover – is a control that, once installed, will continue to provide cover with minimal to no reapplication. Examples include vegetated cover such as sod or established seed.

Water Management Plan – is a plan that outlines how water will be retained and managed on site.

2.2 Construction details

2.2.1 ESC measures:

- Installation notes (e.g., spacing recommendations)
- Detail drawing (plan and profile as needed)
- Samples shown in *Figures 5 to 9*

2.2.2 Phased ESC Drawings:

All construction details listed below shall be reflected on the ESC Plan. The City may require separate ESC plans for each phase of construction as deemed necessary for the proposed development.

Construction key points for the items listed are identified in Section 4.3.

STRIPPING AND GRADING
• Existing ground contours • Adjacent perimeter elevations • Drainage Arrows • Cut/fill marks (may be submitted on a separate sheet) • Adjacent development/undeveloped land • Surrounding critical and environmentally sensitive areas • Tree line • Tree clearing limit • Existing stockpiles • Proposed stockpiles • Haul routes • Site (sediment/water) storage or swales • Rough Grade drop below Final grade at mid lots

UNDERGROUND CONSTRUCTION
• Pumping discharge location • Spill pile footprint • Additional drying area • Limit of disturbance if working within existing SWMF • Concrete washout location within construction boundary • Contour furrowing extents • Mud and dust control responsibility turnover

CONSTRUCTION COMPLETION
• Means of establishing turf (e.g., broadcast seeding, sodding, hydroseeding) • Remaining stockpiles • Temporary swales • Restoration areas • Catch basin protection • Areas that will be landscaped by others

2.3 Existing storm infrastructure

- Catch basins
- Inlets/outlets
- SWMF
- Dry ponds
- French drain
- Swales
- Ditches
- Creek
- Fen
- Wetland

2.4 Erosion Control Matting

- Straw
- Coconut
- Coir
- Polypropylene
- GeoJute

2.5 Stabilized Site Access

Gravel beds shall be at minimum 20m long by 4m wide at site exits.

Other stabilization methods may be used upon approval by the City (e.g., rig mats, matting) and must be labeled and clearly identified on ESC plans. A stabilized access must be maintained or re-established as necessary until Surface construction begins.

2.6 Stockpiles

- Location
- Footprint
- Height
- Volume
- Type of material
- Duration of storage
- Haul route
- Screener location when applicable

Any anticipated changes to the above information after ESC Plans are approved with the Engineering Drawings or a Grading Permit, shall be subject for review by the City through a revision to the ESC Plan.

2.7 Landscaping and Permanent Measures

Permanent measures include:

- Riprap
- Final landscaping
- Pavement
- Restoration

Extended temporary measures that may be required throughout the maintenance periods include:

- Soil tackifier
- Matting
- Furrowing
- Site (sediment/water) storage
- CB socks
- Regular road sweep

- Silt fence

SECTION III. RUSLE-FAC CALCULATION

The Revised Universal Soil Loss Equation for Application in Canada (RUSLE-FAC) can be used to determine if measures are sufficient based on estimated soil loss.

Equation:

$$A = R * K * LS * C * P$$

1. Annual estimated soil loss, (A)

   Calculated A from the equation must be less than the standard allowable:

   $$\mathbf{A_{(allowable)} = 2 \text{ tonnes / hectare / year}}$$

2. Rainfall and Runoff Factor, (R)

   The R-value is a numerical representation of rainfall erosivity. Based on isoerodent map of R values for the Prairie Region shown in *Figure 1*, use R value for Spruce Grove:

   R = 350

3. Soil erodibility Factor, (K)

   K-value is a quantitative measure of a soil's inherent susceptibility/resistance to erosion and the soil's influence on runoff amount and rate.

   To determine K value, gather information below from the geotechnical report and plot on the nomograph shown on *Figure 2* in the same sequence:

   1. Percent silt + percent very fine sand
   2. Percent sand between 0.10-2.0 mm
   3. Percent organic matter
   4. Soil structure
   5. Permeability

   If Soil structure and Permeability are not available, estimates can be taken from *Figures 3-1* and *3-2*, respectively, based on percent clay and percent sand.

If any other information listed above is not available and K value cannot be determined using the nomograph, use conservative default value: **K = 0.079**

4. The Slope Factor, (LS)

   LS is a measure of the effects of slope angle, length, and complexity on erosion.

   Use the table in *Figure 4* to find or interpolate the LS value based on slope and slope length. The table is suitable for high ratio of rill: inter-rill erosion which best describes most construction sites.

5. The Cover and Management Factor, (C)

   C-value is a measure of the relative effectiveness of soil cover systems in preventing or reducing soil loss.

   Provide C-value from manufacturer for management practices such as hydroseed, tackifier, mulch, and so on. Some typical values are:

Sod,	**C = 0.01**
Wood chips,	**C = 0.06**
Broadcast seeding,	**C = 1.0**
No cover,	**C = 1.0**

6. The Support Practice Factor, (P)

   P-value accounts for the erosion control effectiveness of support practices.

   For control measures such as silt fence, provide P-value from manufacturer. Some typical values are:

Silt fence	**P = 0.6**
Straw wattles	**P = 0.6**
Contour furrowing,	**P = 0.6**
Storage,	**P = 0.1** (minimum 250 m^3 / ha)

   Should there be any appeal against City's request for an additional ESC measure, it shall be supported by a complete RUSLE-FAC calculation. The appeal shall be subject to review by the City.

SECTION IV. CONSTRUCTION

4.1 Startup

All ESC plans must be approved by the time of Construction Startup. At the pre-construction meeting, the following must be established.

a. Installation responsibility
b. Maintenance responsibility
c. Reporting responsibility
d. Date of install
e. Start of reporting
f. Stabilized site access details
g. Dust control responsibility and point of contact for resident complaints
h. Mud tracking control responsibility and point of contact for resident complaints
i. Conditions of existing infrastructure at site entrance

4.2 Pumping

All pumping within the City must adhere to the following conditions:

a. Notify the City prior to pumping.
b. Adequate dewatering bags made of geotextile fabric are required.
c. If pumping overland, discharge to an open area directed towards a drainage ditch. Do not discharge directly to a City owned ditch.
d. If pumping to storm, discharge on the gutter directed towards a catch basin. Do not pump directly to a catch basin or manhole.
e. Filtration system must be attached to the pump at the receiving end.
f. Chlorinated water must be dechlorinated before discharge.
g. Under no circumstance should there be any discharge to a fen.
h. All pumping must be continuously monitored.
i. If any sign of erosion and/or sediment transport arise, pumping must be ceased immediately and re-evaluated.
j. Whenever feasible, discharge within the same developer's land that has water storage capacity.
k. Under no circumstance shall pumping be discharged to a City owned Storm Water Management Facility.

4.3 Stripping and Grading

4.3.1 Existing Ground: ESC measures specified on ESC plans for the Grading phase must be in place prior to stripping. Downstream areas must be protected throughout the grading program.

4.3.2 Adjacent Perimeter Elevations: Where proposed elevations along perimeter will not match adjacent ground, a slope no steeper than 3:1 will be required at transition. Soil cover on the slope may be required.

4.3.3 Adjacent land:

a. Development: Drainage may be allowed to enter if sediment is controlled and retained within construction limits.
b. Undeveloped: May be used for drainage and sediment storage if owned by the same developer or otherwise permitted by landowner.
c. City land: No drainage or sediment transport allowed.

4.3.4 Stockpiles and haul routes: Dust control must be observed on stockpiles and haul routes to and from the piles at all times.

A stockpile is considered dormant once hauling in or out has ceased.

Dormant stockpiles to be stored onsite for more than forty-five (45) days must be continuously monitored to mitigate dust. The City may require cover or stabilization on stockpiles should the dust mitigation be deemed ineffective.

4.3.5 Site storage: A temporary ditch or basin shall be placed when necessary to collect and/or intercept water and sediment from leaving site. When 1/3 of the height is reached, storage must be emptied. Refer to Section 4.2 for Pumping guidelines. Storage shall have a minimum 250 m^3 capacity per hectare of drainage area.

4.4 Construction Completion and Maintenance

All required ESC measures must be in place prior to freeze up.

Developer responsibility during Maintenance Periods include:

a. Builder damages on established ESC measures along back of lots
b. Mud tracking on paved roads
c. Unestablished turf on SWMF slopes
d. Temporary ditch
e. Drainage around temporary turnarounds
f. Catch basin socks maintenance

4.5 Catch basin protection

Catch basin socks placement period:

a. To be removed in the fall right before snowfall or as directed by the City;
b. To be re-installed in the spring right after thaw or as directed by the City.

4.6 End of Maintenance

Developers and owners are responsible for ESC until all improvements have been issued FAC, including Landscaping, except when there is no SWMF within or adjacent to the stage, and when the City is in full agreement, then ESC responsibility may be ceased at the issuance of a complete Surface FAC.

Regular inspection and reporting frequency may be reduced to bi-weekly submissions upon issuance of the Underground FAC.

SECTION V. INSPECTION AND REPORTING

5.1 **Qualification:** Inspections must be completed by a trained individual who is certified or is under direct supervision of a certified CISEC.

5.2 **Regular inspection:** Every 7 days or as conditioned in Section 4.6.

5.3 **Critical inspection:** Within 24 hours of a heavy storm event (20mm or more), thaw or as deemed necessary. May be submitted in lieu of the regular inspection if the regular frequency is still met.

5.4 **Reporting:** Must be submitted within 48 hours of inspection.

5.5 **Winter reporting:** Essential inspections required. Regular inspections and reporting may cease in the winter unless deemed necessary.

5.6 **Reports:** Must include, at minimum, the following information.

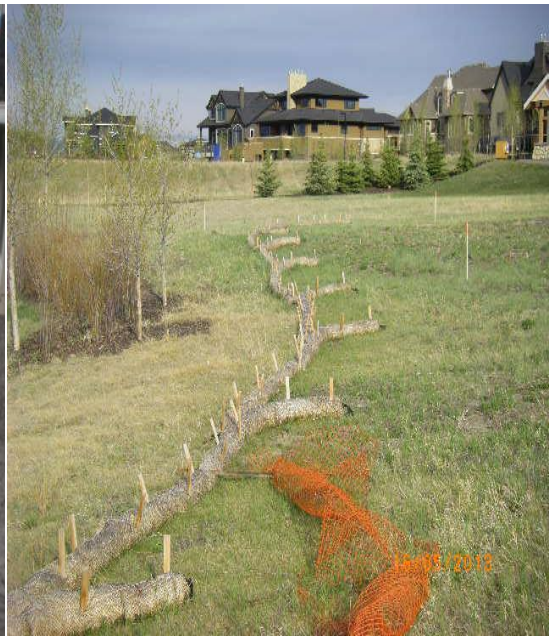
a. Date of inspection
b. Date of last inspection
c. Name and company of inspector
d. Subdivision and Stage
e. Current weather
f. Recent precipitation in mm
g. Current phase of construction
h. Inspection checklist
i. Observations – detailed description with date stamped photos
j. Action Items – detailed description with date stamped photos
k. Site plan – use phased ESC plans accordingly

5.7 **Inspection checklist:** Must include, at minimum, the following information.

a. Have stripped areas/exposed soils/steep slopes been protected and/or stabilized?
b. Have waterways and drainage ways been protected and stabilized?
c. Are perimeter controls in place and functioning adequately?
d. Are offsite/downstream properties/waterways protected?
e. Are construction entrances stabilized?
f. Are Sediment controls in place and functioning adequately?
g. Are Transport controls in place and functioning adequately?
h. Are Erosion controls in place and functioning adequately?

SECTION VI. RECOMMENDED PRACTICES

6.1 J-hooks: As opposed to a straight line, turn inward at an effective interval to avoid concentrated flow parallel to the line of install and also provide better storage.



6.2 Contour Furrowing: Creating furrows and ridges against the direction of slope to reduce soil erosion and to trap sediment, particularly useful for lots backing onto SWMF.

6.3 Check dams: Installed along ditches to reduce velocity, improve storage mechanism, and trap sediments.

6.4 Rock check dams: Check dams built with rocks to help reduce velocity and filter sediment along ditches.

6.5 Hydroseeding: speeds up germination process for faster and fuller vegetation establishment.

SECTION VII. FIGURES

Figure 1. Isoerodent map showing R values for the Prairie Region (Agriculture and Agri-Food Canada, 2002)

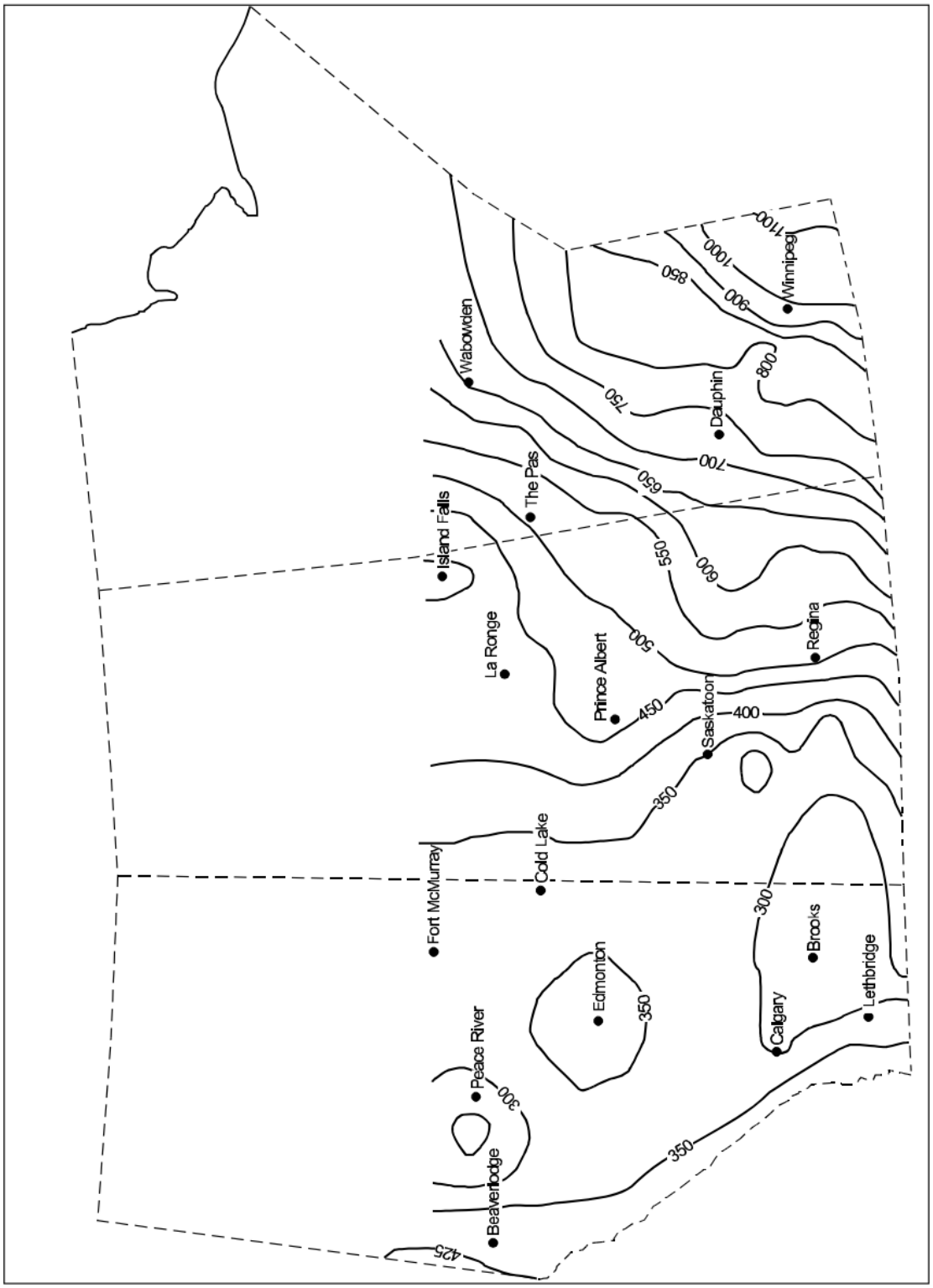


Figure 2. Soil erodibility nomograph (Foster et al., 1981)

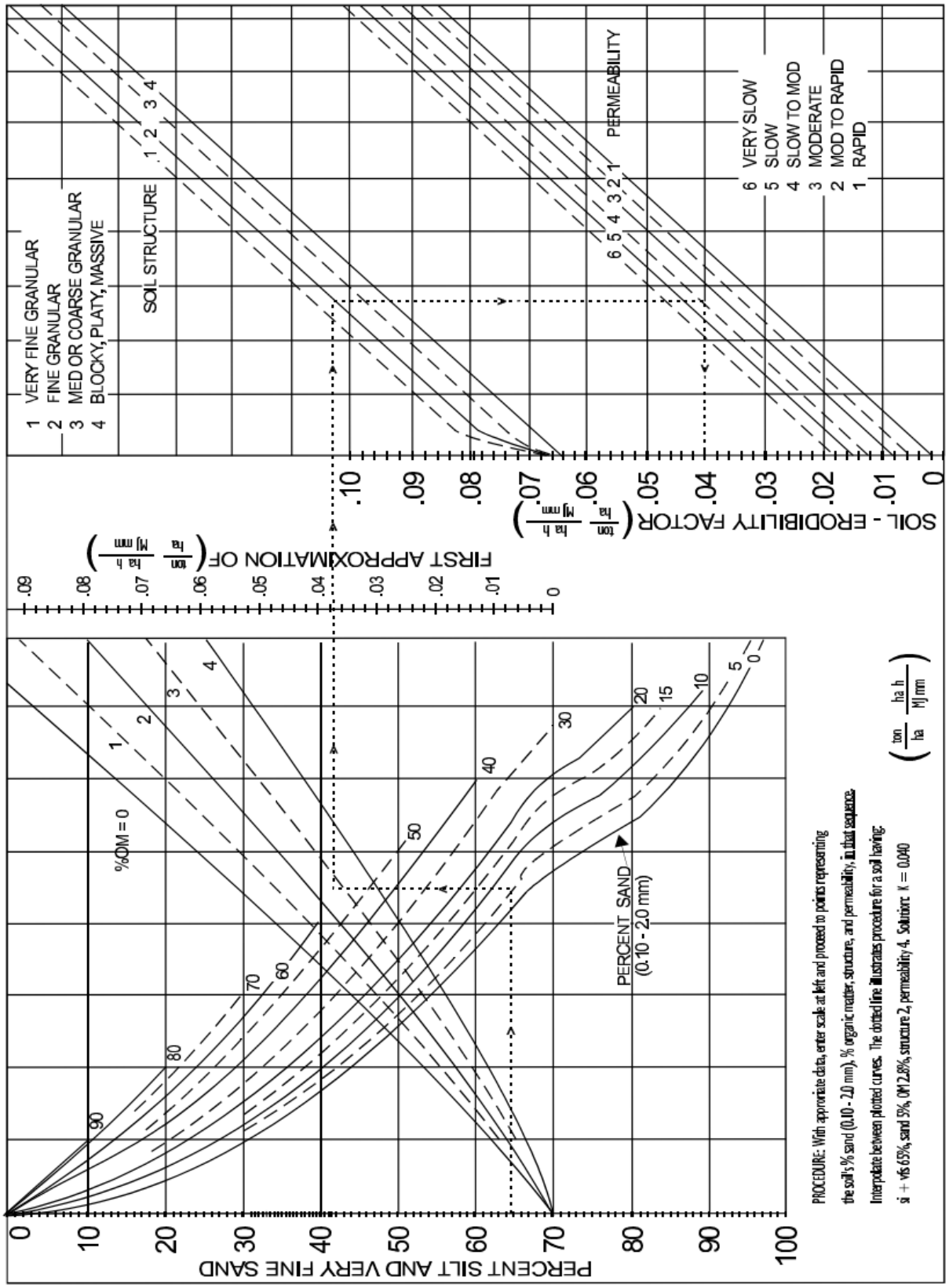


Figure 3-1. Structure code based on textural classification (Ontario Centre for Soil Resource Evaluation, 1993)

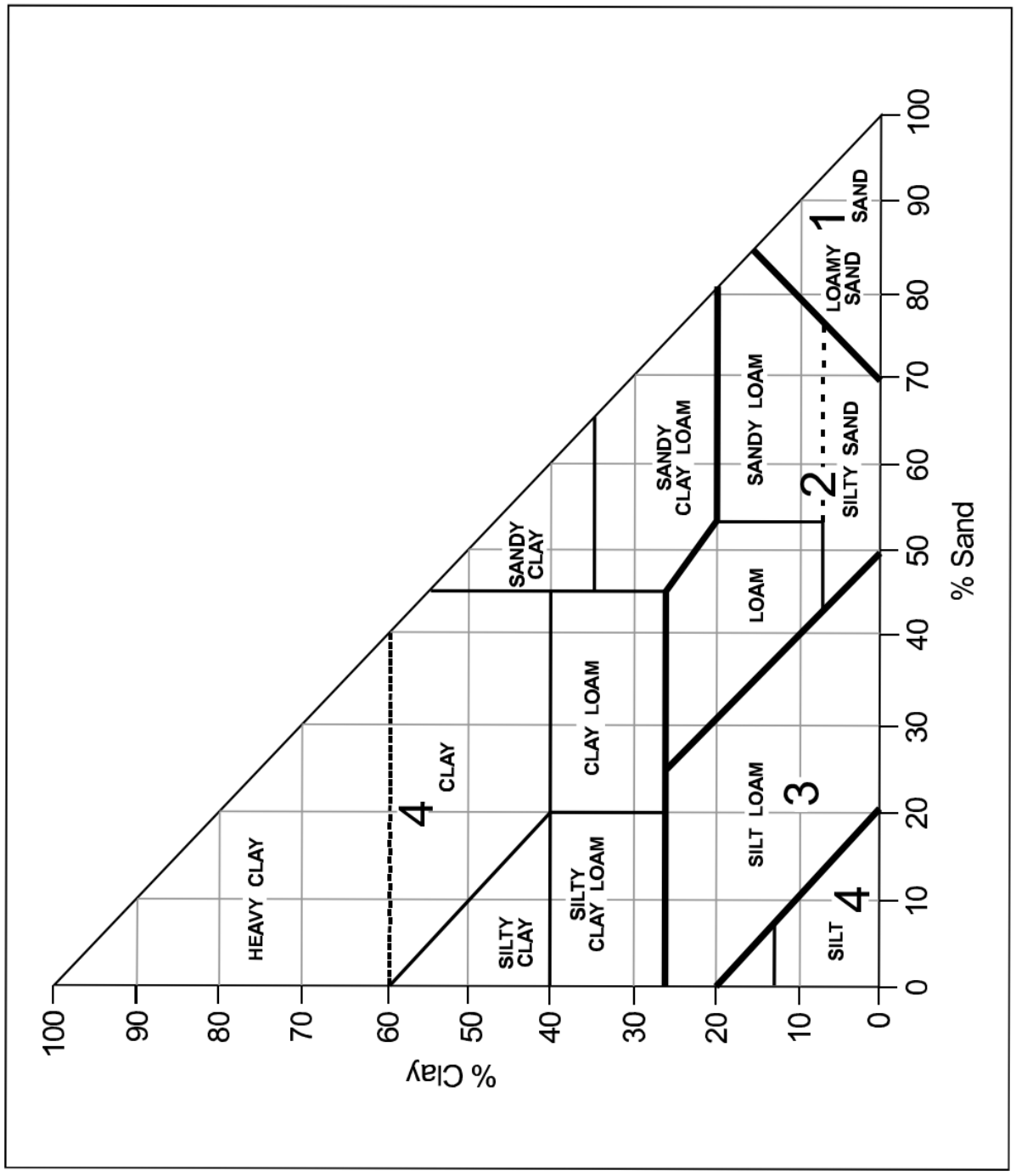


Figure 3-2. Permeability code based on textural classification (Ontario Centre for Soil Resource Evaluation, 1993)

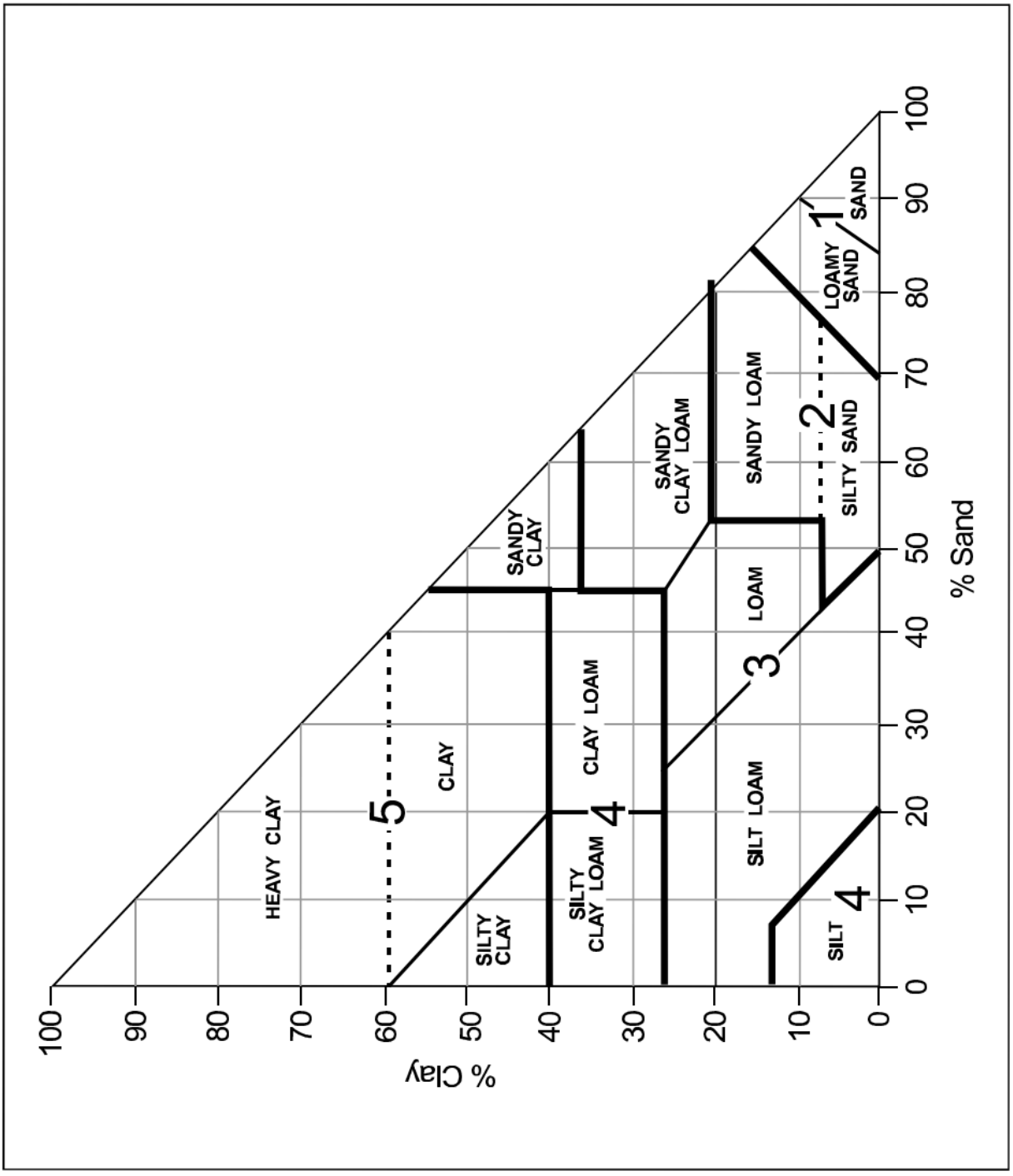


Figure 4. LS for high ratio of rill:inter-rill erosion, such as highly disturbed soil conditions and freshly prepared construction sites, with little or no cover (not applicable to thawing soils), (Agriculture and Agri-Food Canada, 2002)

	Slope Length in metres													
Slope %	1	2	4.57	5	10	15	25	50	75	100	150	200	250	300
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13
1	0.09	0.09	0.09	0.09	0.11	0.12	0.14	0.17	0.19	0.20	0.23	0.24	0.26	0.27
2	0.13	0.13	0.13	0.14	0.18	0.21	0.26	0.34	0.40	0.44	0.52	0.58	0.64	0.68
3	0.17	0.17	0.17	0.17	0.24	0.29	0.37	0.52	0.63	0.72	0.88	1.01	1.12	1.22
4	0.20	0.20	0.20	0.21	0.30	0.38	0.49	0.71	0.88	1.03	1.28	1.49	1.67	1.84
5	0.23	0.23	0.23	0.24	0.36	0.46	0.61	0.91	1.14	1.35	1.70	2.01	2.28	2.53
6	0.26	0.26	0.26	0.28	0.42	0.54	0.73	1.11	1.42	1.68	2.15	2.56	2.93	3.27
7	0.29	0.29	0.29	0.31	0.48	0.61	0.85	1.31	1.69	2.03	2.62	3.14	3.61	4.05
8	0.32	0.32	0.32	0.34	0.53	0.69	0.96	1.51	1.97	2.38	3.09	3.73	4.31	4.86
9	0.35	0.35	0.35	0.37	0.59	0.78	1.09	1.73	2.27	2.75	3.61	4.37	5.08	5.73
10	0.35	0.36	0.40	0.42	0.68	0.90	1.27	2.04	2.69	3.28	4.32	5.26	6.13	6.94
12	0.36	0.40	0.49	0.53	0.86	1.14	1.64	2.67	3.56	4.36	5.80	7.11	8.32	9.46
14	0.38	0.44	0.58	0.62	1.03	1.38	2.00	3.30	4.43	5.45	7.32	9.01	10.59	12.09
16	0.39	0.47	0.67	0.72	1.20	1.62	2.36	3.93	5.31	6.57	8.86	10.96	12.92	14.79
20	0.41	0.53	0.84	0.90	1.53	2.08	3.07	5.20	7.07	8.81	11.99	14.92	17.69	20.32
22	0.43	0.57	0.92	0.99	1.69	2.31	3.42	5.82	7.95	9.93	13.56	16.92	20.09	23.11
25	0.45	0.62	1.04	1.12	1.92	2.64	3.93	6.75	9.26	11.59	15.91	19.91	23.70	27.32
30	0.48	0.69	1.24	1.33	2.30	3.18	4.77	8.26	11.40	14.33	19.77	24.84	29.65	34.27
40	0.53	0.83	1.59	1.71	3.01	4.19	6.34	11.13	15.46	19.53	27.15	34.30	41.11	47.67
50	0.58	0.95	1.91	2.06	3.65	5.09	7.75	13.72	19.17	24.29	33.93	43.00	51.68	60.05
60	0.63	1.07	2.19	2.36	4.21	5.89	9.01	16.04	22.48	28.55	40.00	50.82	61.18	71.20

Source: RUSLEFAC Handbook, Agriculture Canada (modified by: Joe Buchner, CPESC)

Figure 5. Silt Fence

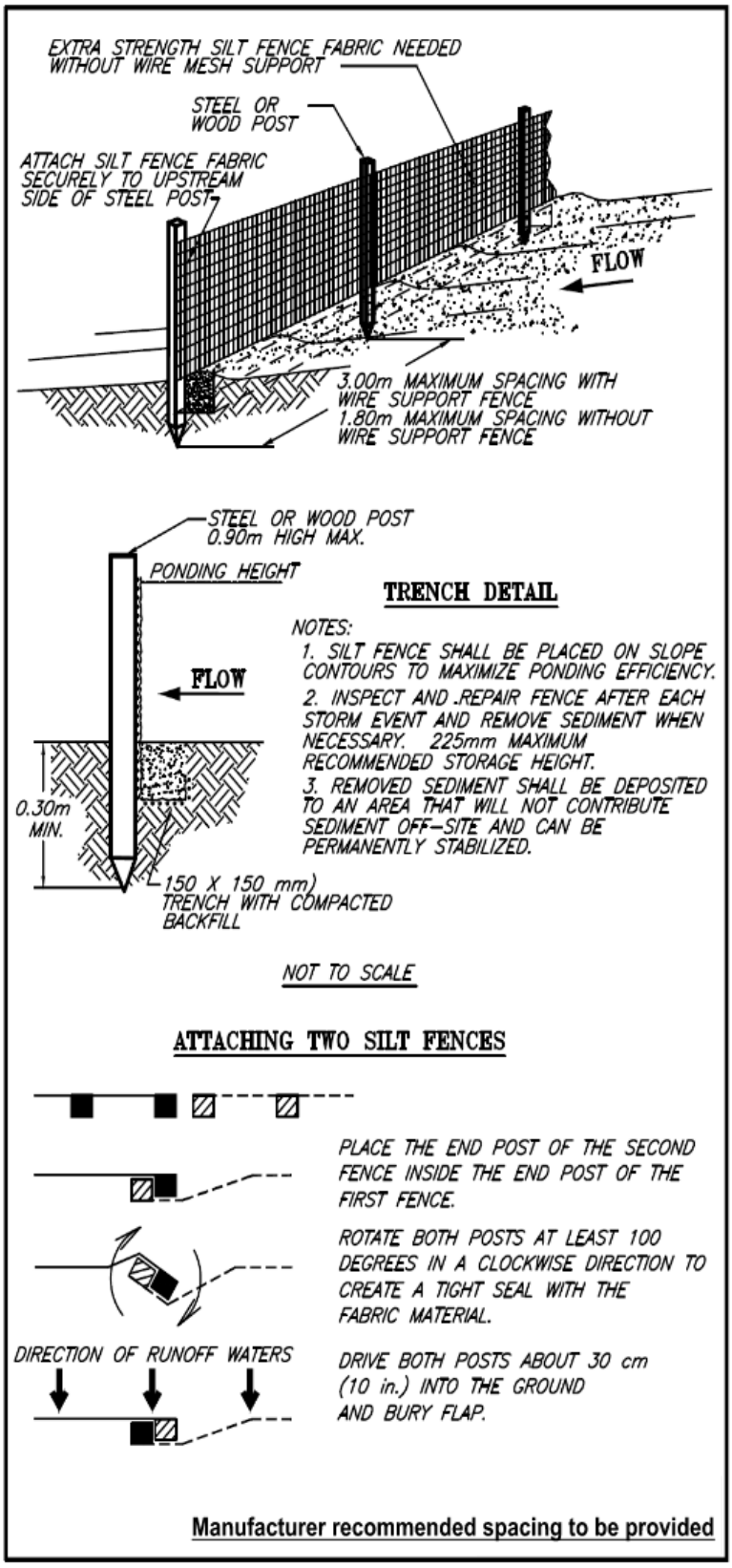


Figure 6. Straw Wattle

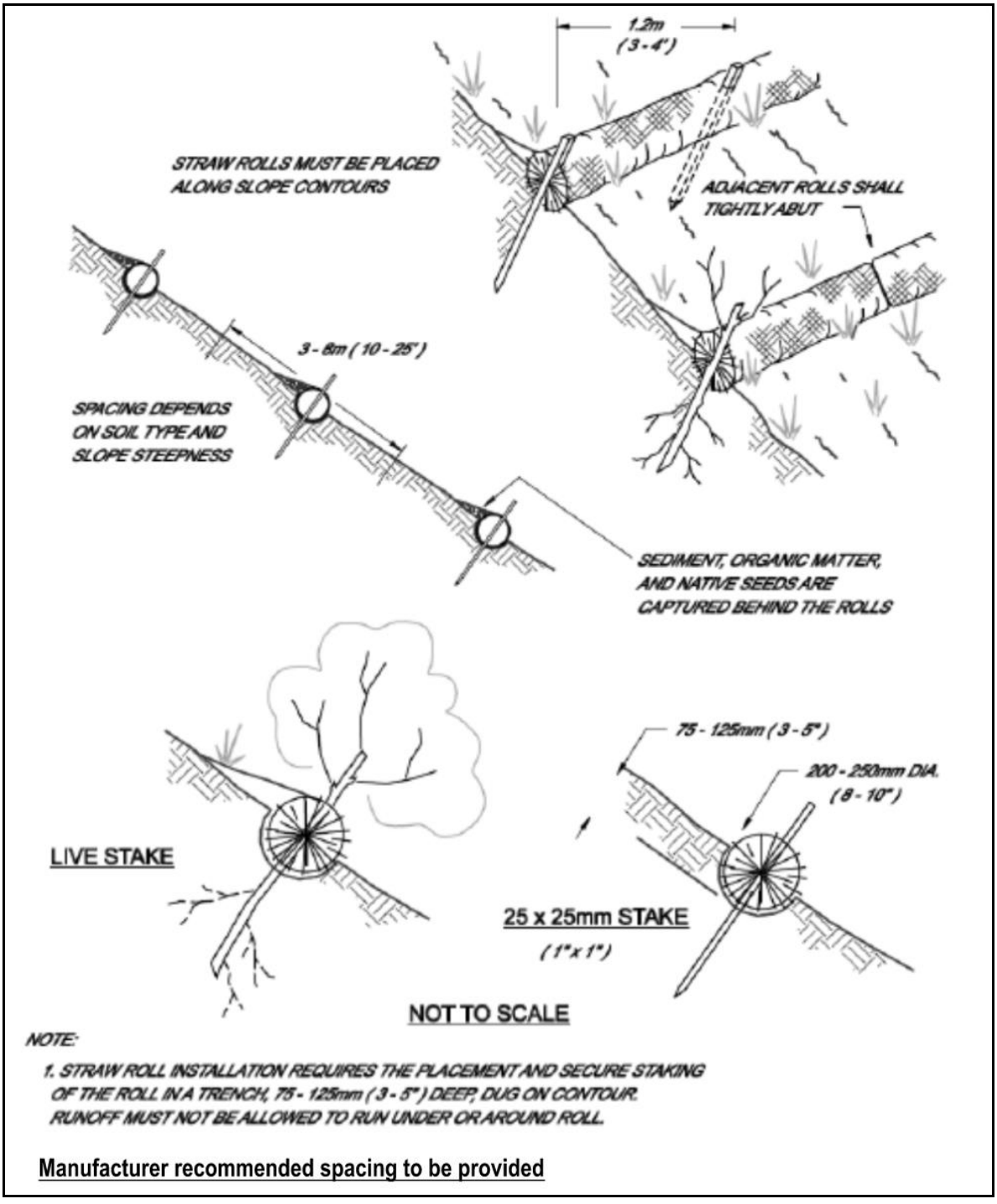


Figure 7. Contour Furrowing

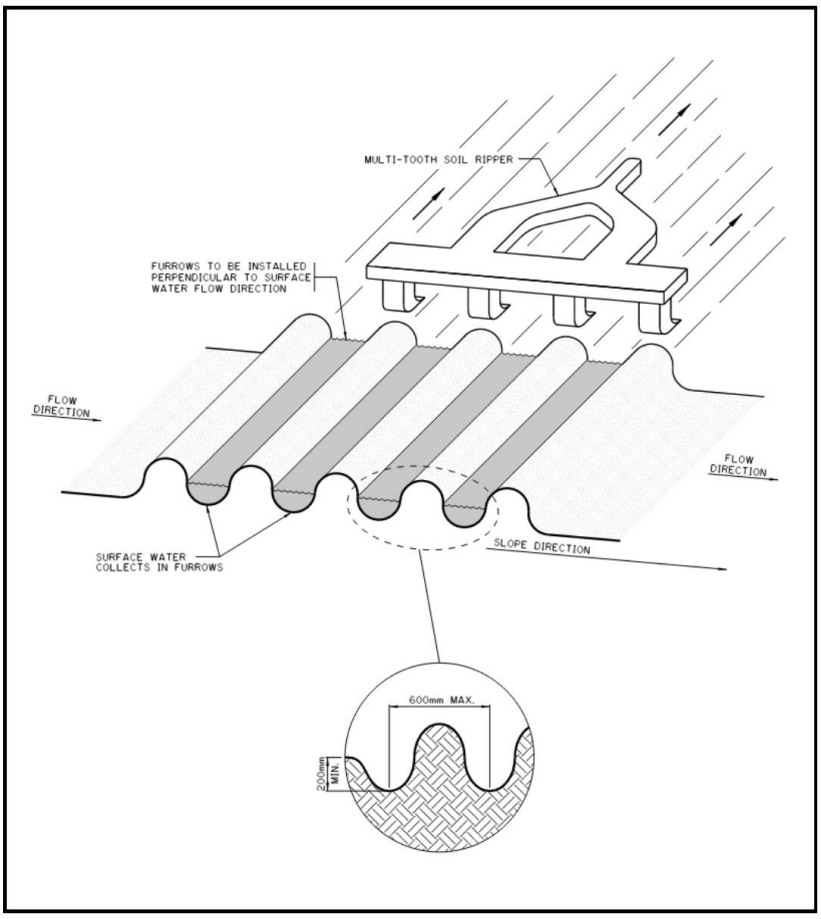


Figure 8. Ditches with Check Dams

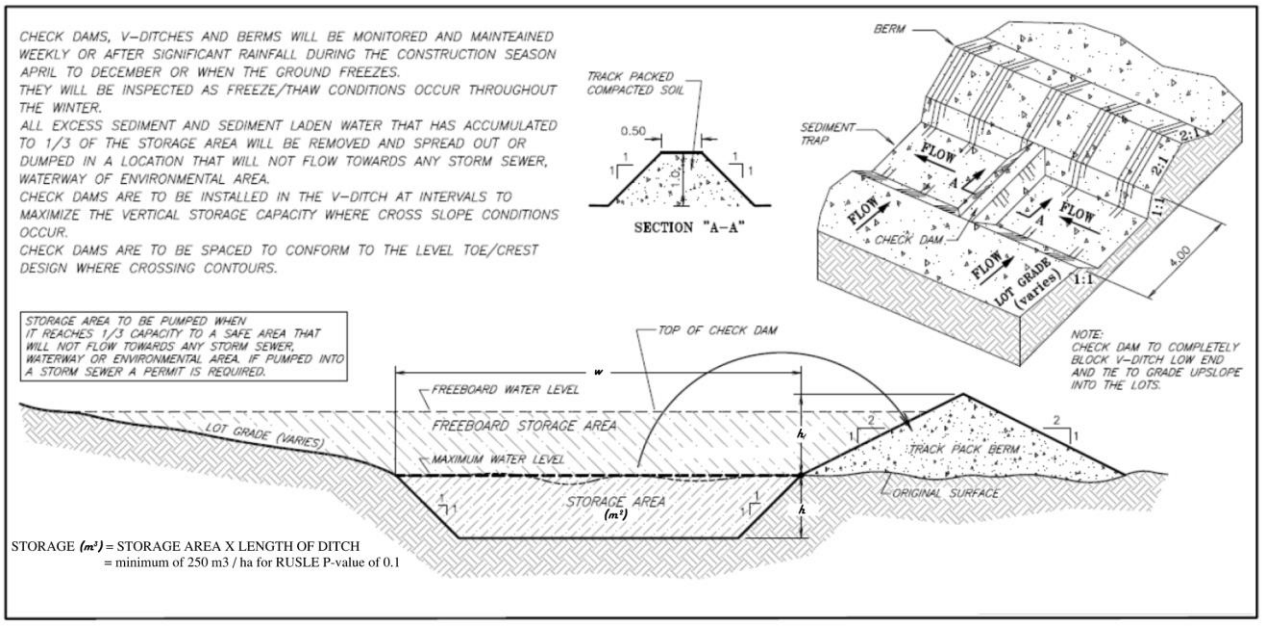
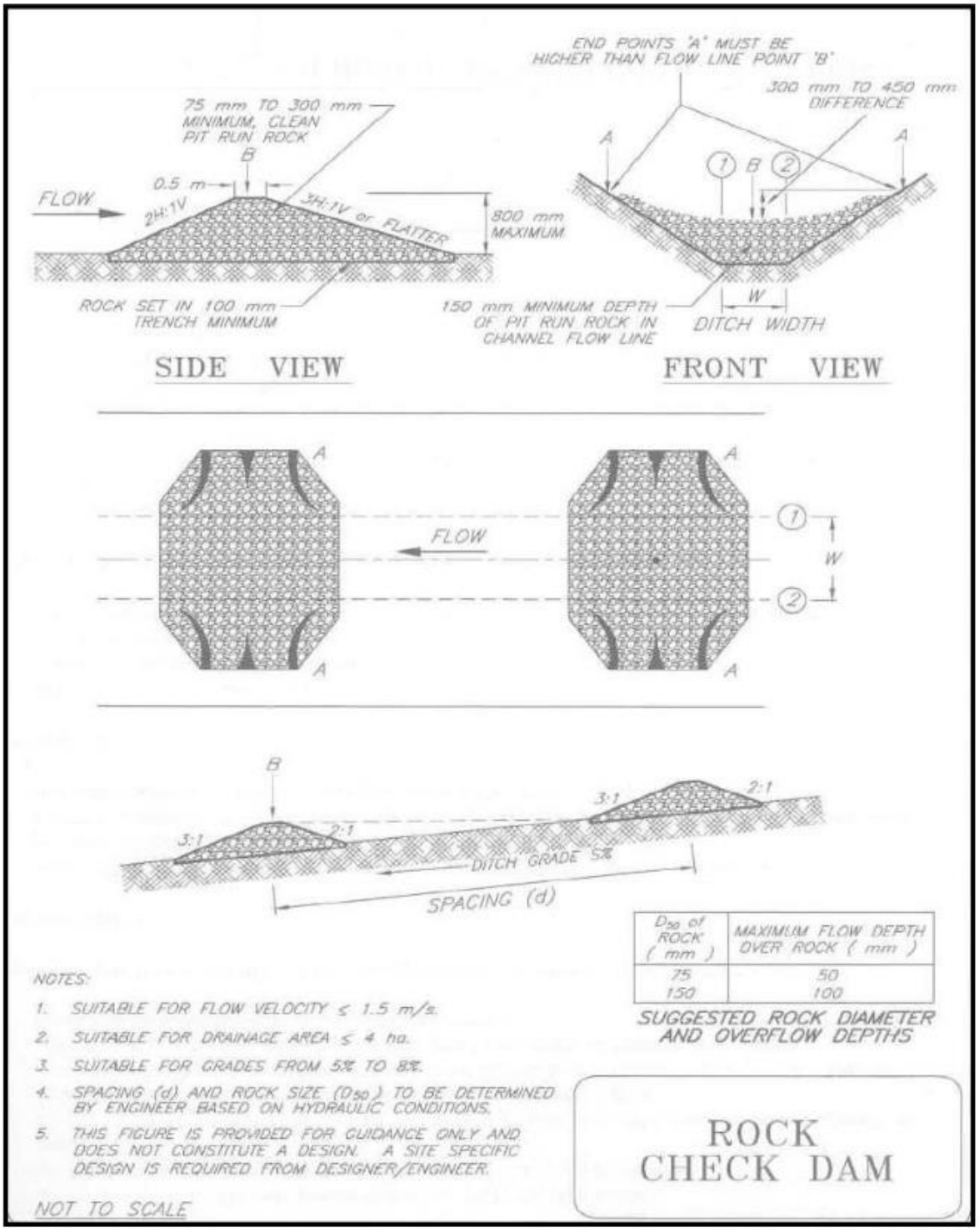


Figure 9. Rock Check Dams



SECTION VIII. REFERENCES

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