CHAPTER 4 :

INSPECTION PROCEDURE AND SEQUENCE

Stage of Inspection

1. Pre inspection
2. Inspection and sampling
3. Report and compliance

PRE – INSPECTION

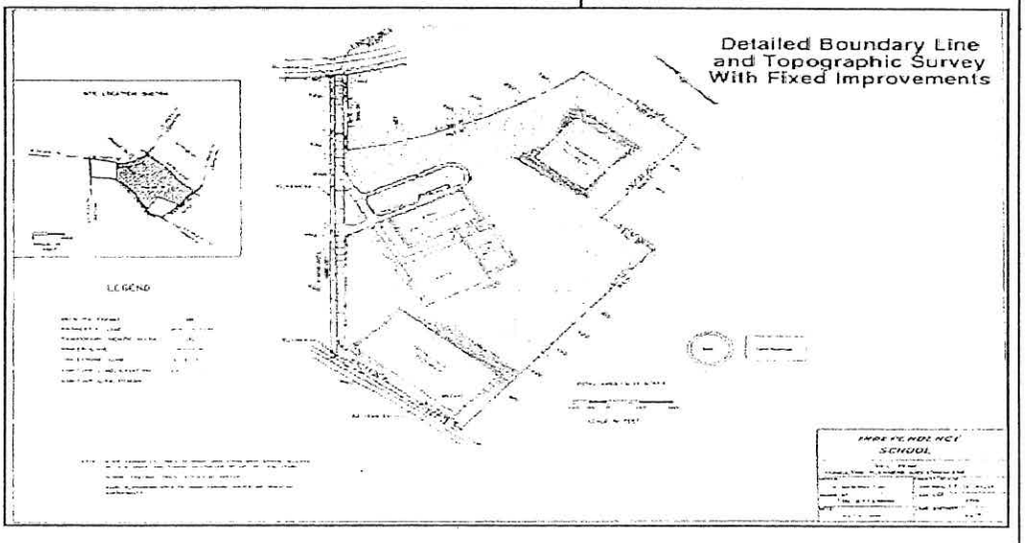
Pre inspection

Review plans :

- Contour maps
- Critical or sensitive areas
- Space for BMPs
- Phasing installation
- Temporary soil stabilization
- Final discharge points
- Maintenance plans
- Borrow, stockpile, and waste storage
- List of specific items and potential problem
- Strengthened areas and extra maintenance

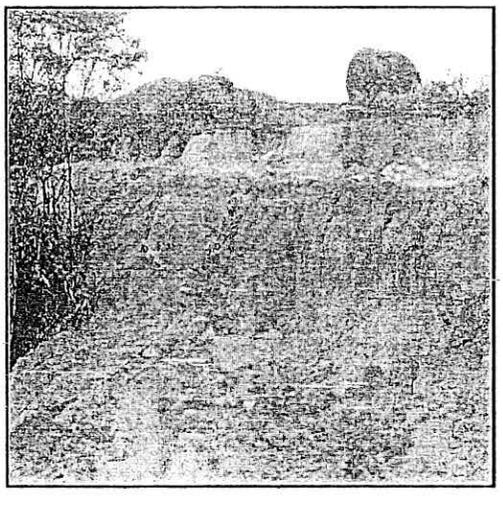
Pre inspection

Contour maps



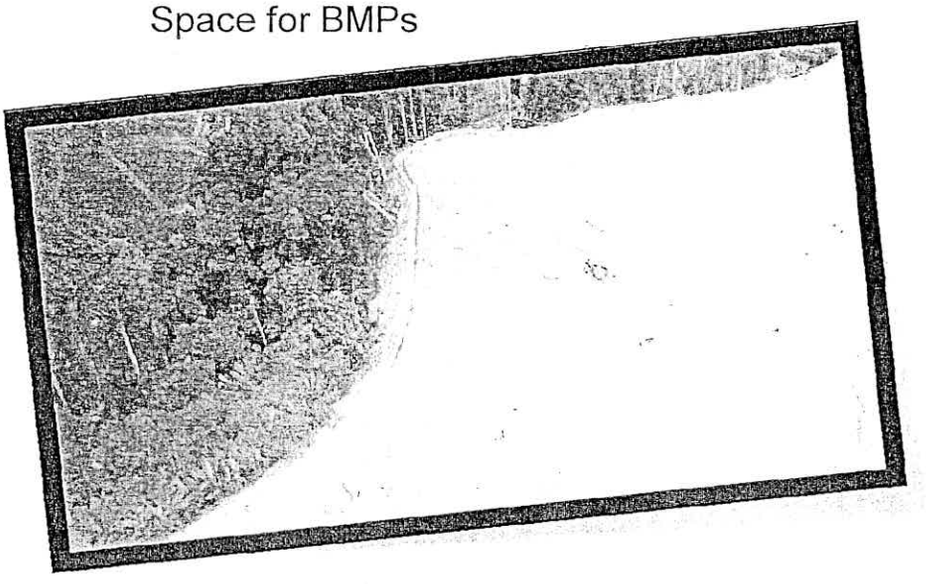
Pre inspection

Critical or sensitive areas.



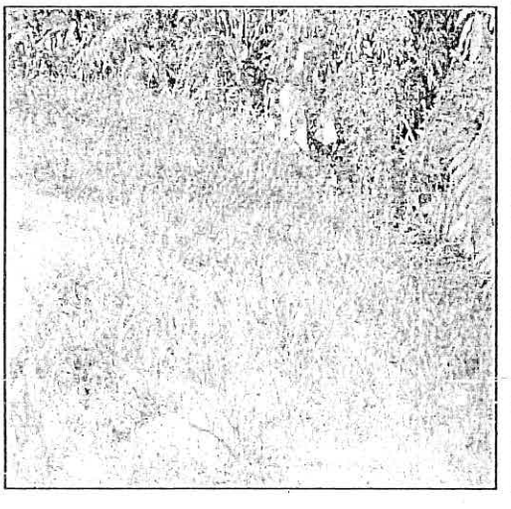
Pre inspection

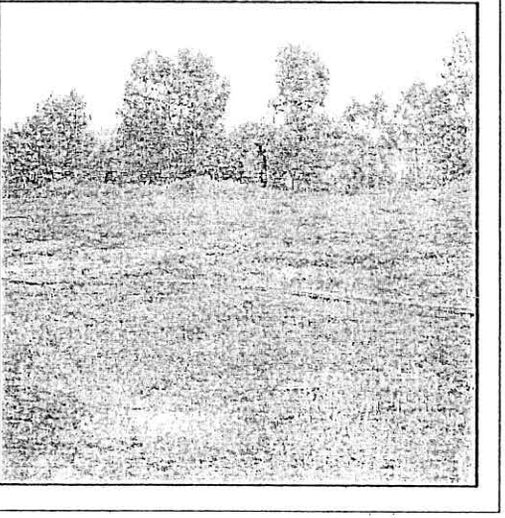
Space for BMPs



Pre inspection

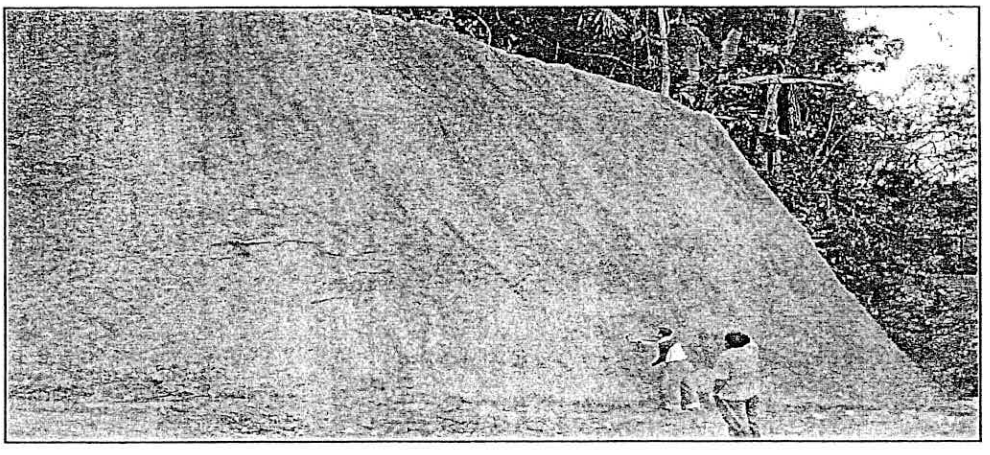
Temporary soil stabilization





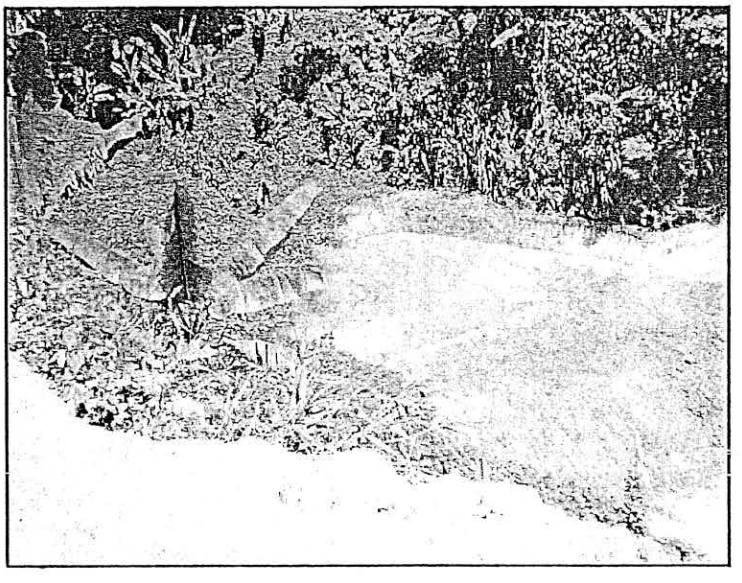
Pre inspection

Slope stabilized within seven working day



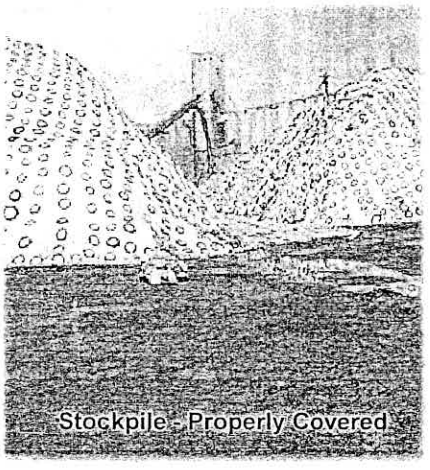
Pre inspection

Final discharge points.

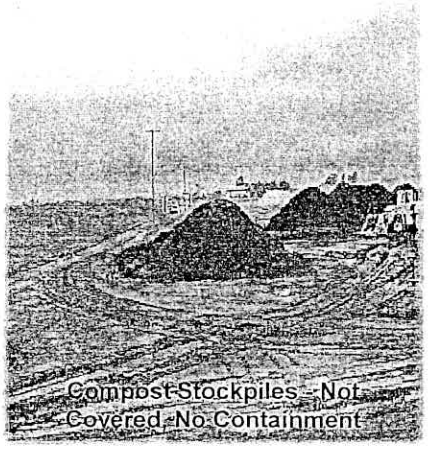


Pre inspection

Borrow, stockpile, and waste storage areas



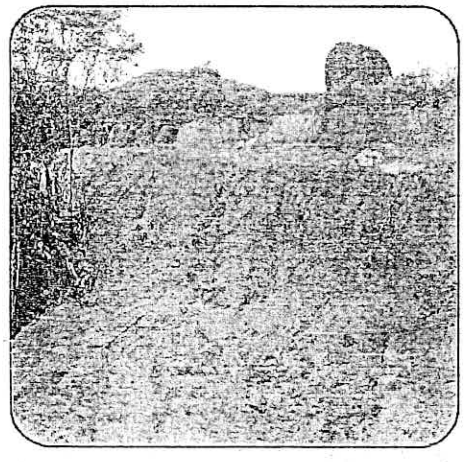
Stockpile - Properly Covered



Compost Stockpiles - Not Covered - No Containment

Pre inspection

Highlight potential problem.



Pre inspection

Before you leave for the construction site:

- *Take the time to review the plans.*
- *Outline approach for each inspection.*
- *Take a copy of the approved plans.*
- *Bring project file and reporting forms.*
- *Take equipment for and documenting.*
- *Be sure to have all necessary personal protection equipment*

PRE – CONSTRUCTION MEETING

Preconstruction Meeting

i. *Discuss inspection schedule.*

ii. *Designate contact person for compliance issues.*

iii. *Inform that the ESCP need to be updated regularly.*

iv. *Walk the site together to evaluate the Plans.*

v. *Discuss the schedule for clearing and grading.*

vi. *Clarify who is responsible for inspecting, cleaning, and repairing the BMPs*

INSPECTION OF SITE

PICTURE / PHOTOS :

- Are BMPs installed as shown on the approved plans?
- Is erosion being controlled onsite?
- Is sediment being contained onsite?
- Are internal inspections being recorded and available for review?

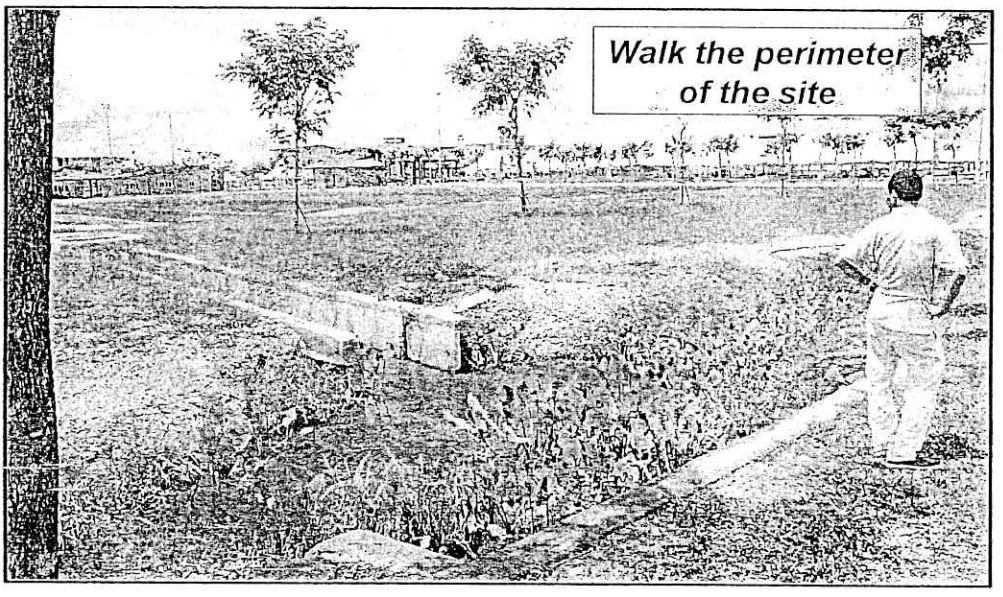
PICTURE / PHOTOS :

- Are previous noncompliance issues addressed within seven days of their occurrence?
- Are other potential sources of pollution being controlled?

INSPECTION GUIDELINES

- *Walk the perimeter of the site*
- *Take detailed*
- *Start from the lowest point*
- *If sediment is flowing offsite, go far enough downstream to see the extent of the damage. Photograph, date and document the damage. Estimate the sediment volume.*
- *If turbidity is present in waters, sample upstream and downstream of the discharge point*
- *Check basins and traps sized*
- *Check critical items (critical inspection items)*
- *Always fill out the inspection report*

INSPECTION GUIDELINES



INSPECTION GUIDELINES

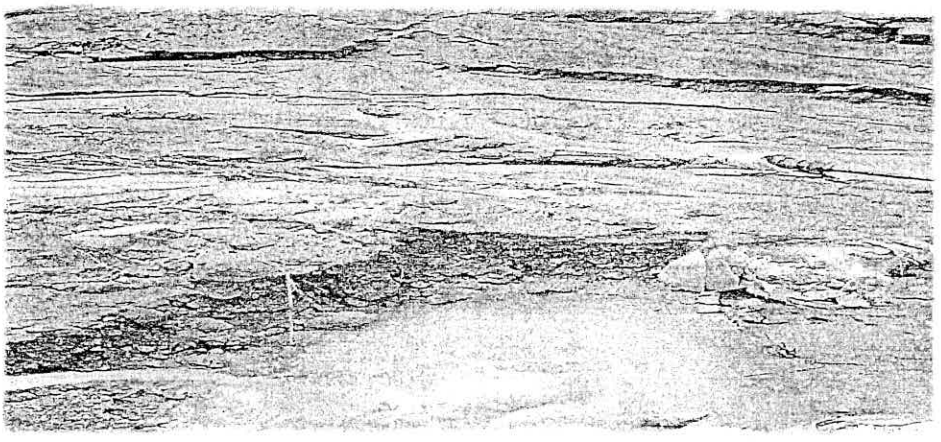
Take detailed

.....they may be needed as evidence in court

INSPECTION GUIDELINES

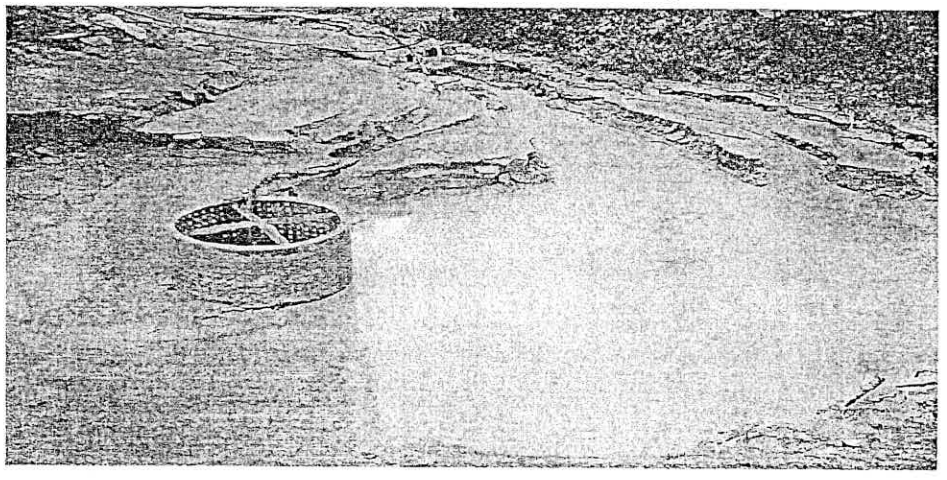
INSPECTION GUIDELINES

If sediment is flowing offsite, go far enough downstream to see the extent of the damage.



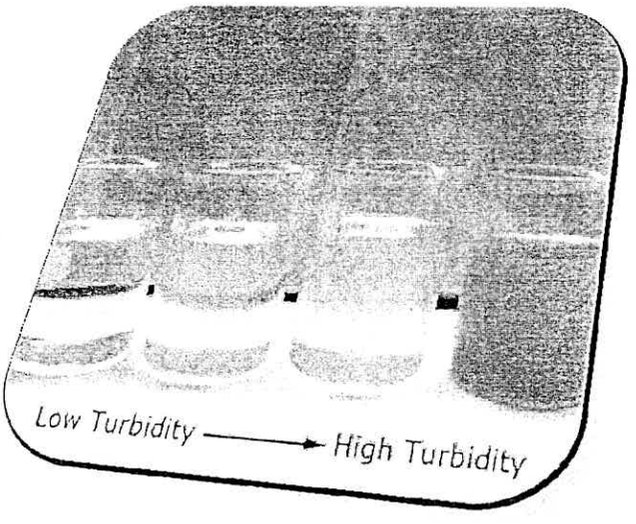
INSPECTION GUIDELINES

If sediment is flowing offsite, go far enough downstream to see the extent of the damage.



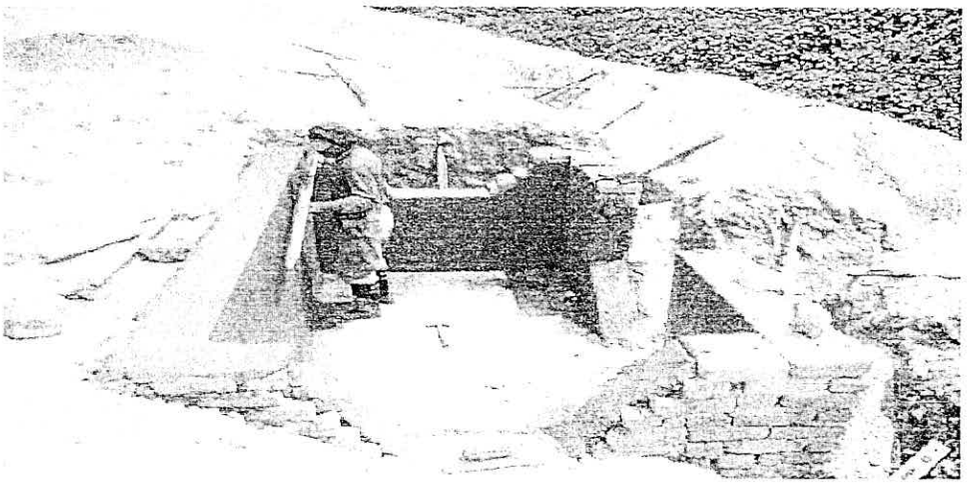
INSPECTION GUIDELINES

If turbidity is present in waters, sample upstream and downstream of the discharge point



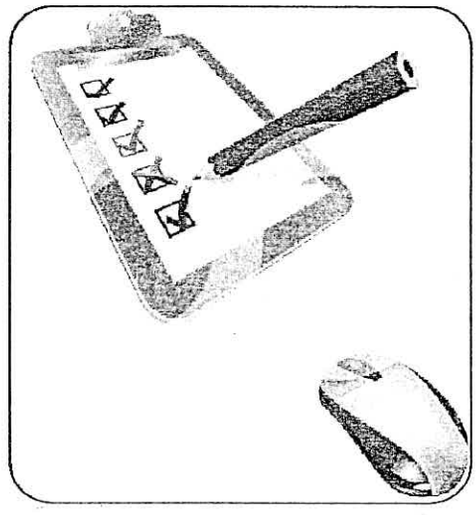
INSPECTION GUIDELINES

Check basins and traps sized



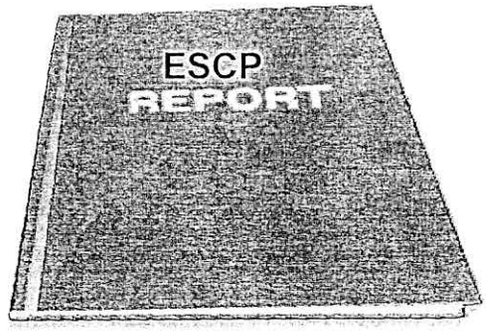
INSPECTION GUIDELINES

Check critical items
(critical inspection items)



INSPECTION GUIDELINES

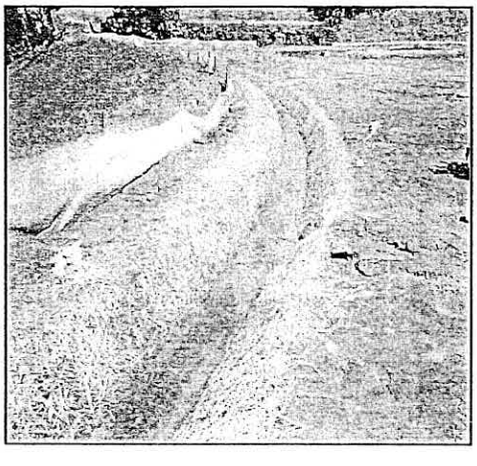
Always fill out the inspection report

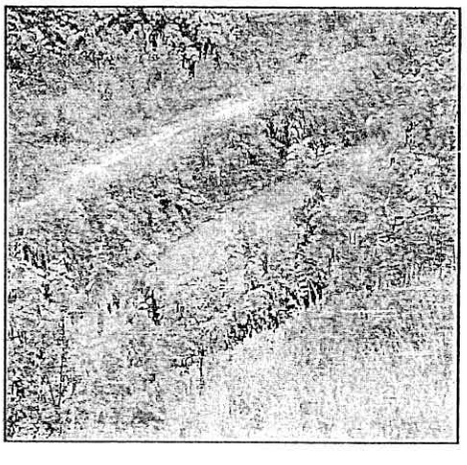


CRITICAL INSPECTION ITEMS

Critical Inspection Items

- *Run-Off Control Areas*



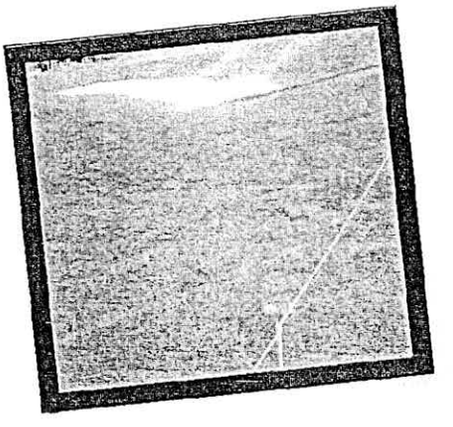


Critical Inspection Items

- *Bare Soil or Disturbed Areas*

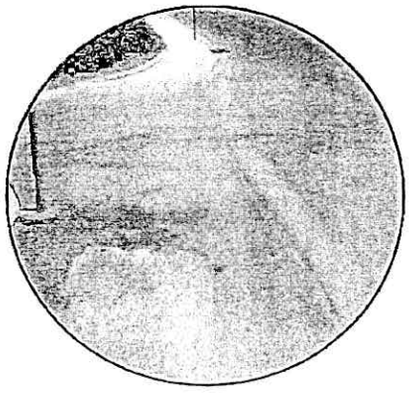
Critical Inspection Items

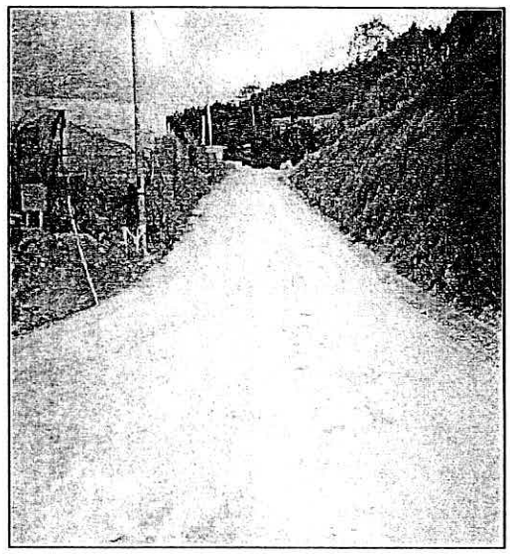
- *Stabilized Areas*



Critical Inspection Items

- ***Construction - Site Entrances/Exits***

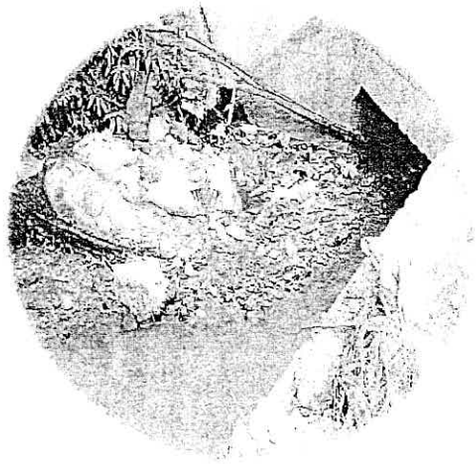




Critical Inspection Items

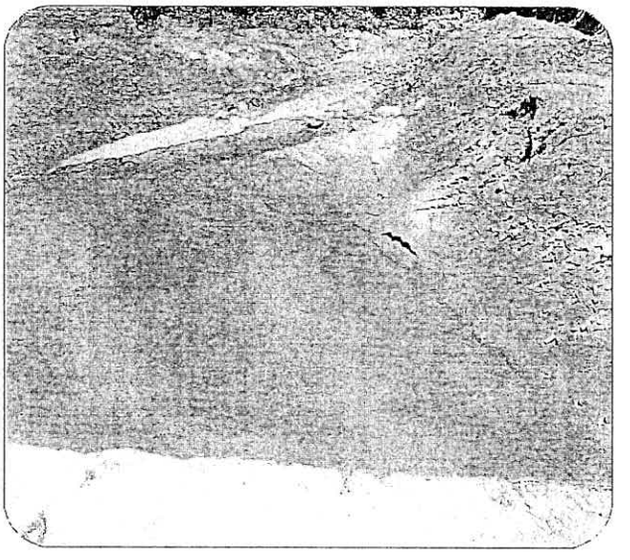
- ***Contamination***

...Locate and remove sources



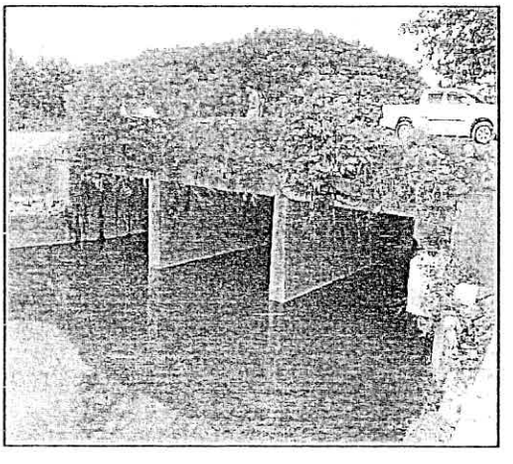
Critical Inspection Items

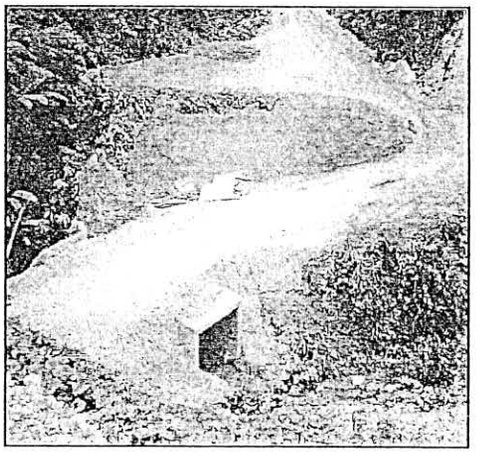
- *Discharge Points*



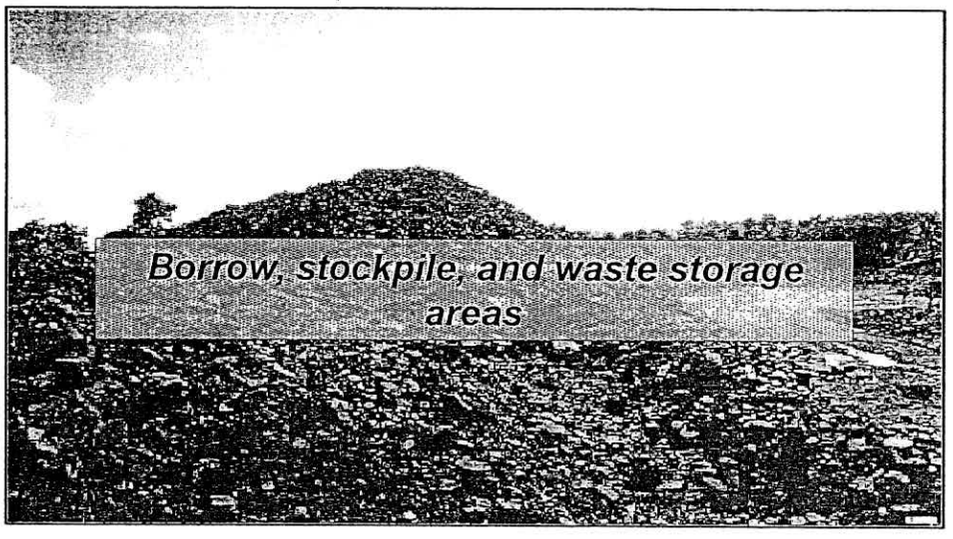
Critical Inspection Items

River crossing/Diversion





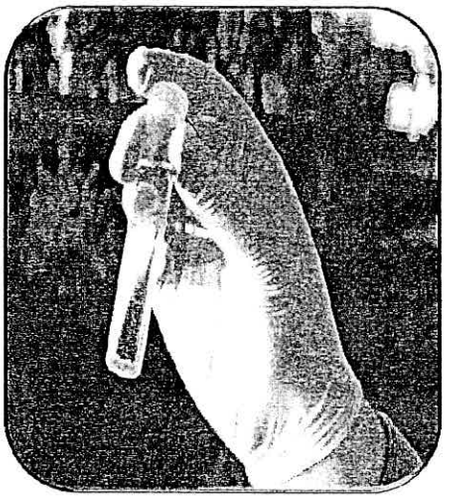
Critical Inspection Items



SAMPLING FOR POLLUTANTS

Sampling for Pollutants

1. *Collect samples and assign laboratory analysis in accordance with requirements*
2. *Verify chain of custody*
3. *Non visual pollutant sampling*
4. *Sampling equipment and calibration*



CAUSES OF NONCOMPLIANCE

CAUSES OF NONCOMPLIANCE

1. *The responsible party has made little or no effort to comply.*
2. *There are design errors in the erosion control system or the site conditions have changed.*
3. *The installation or maintenance of a measure is faulty or inadequate.*
4. *Severe weather has occurred.*

THE REPORT

The Report

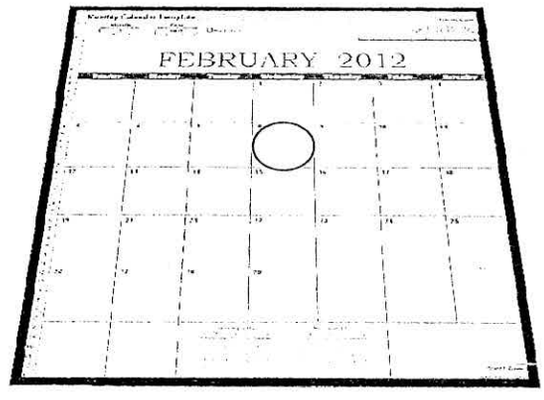
- ***Name of the Inspector and all qualifications /credentials***

Certifications such as CPESC, CPSWQ, or CESSWI should be included into the report.

The Report

- ***Date of inspection***

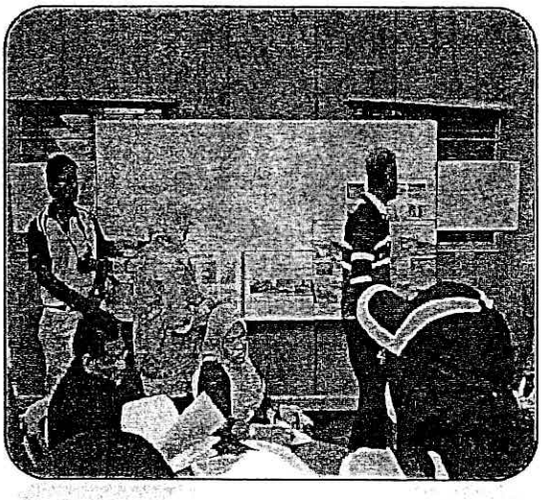
Verify that the inspections are being performed within the scheduled timeframe.



The Report

- ***Points of contact or key individuals on-site***

Create continuity, should a new Inspector be assigned to this site.

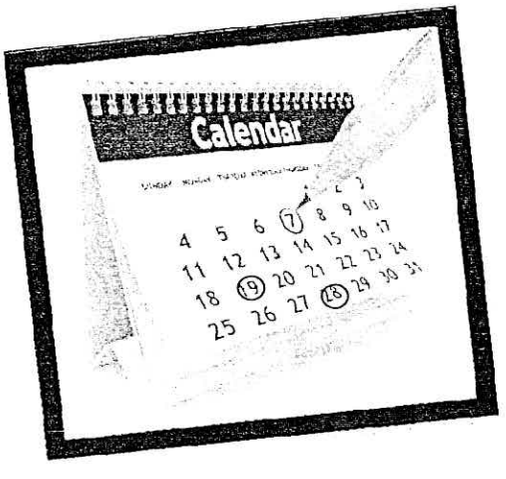


The Report

- ***Inspection frequency***

Weekly or every two week inspections.

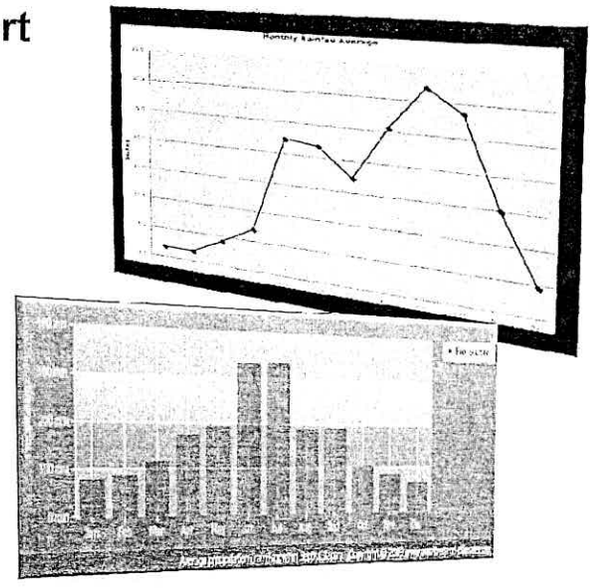
There should be storm event inspections for every phase of the development if possible.



The Report

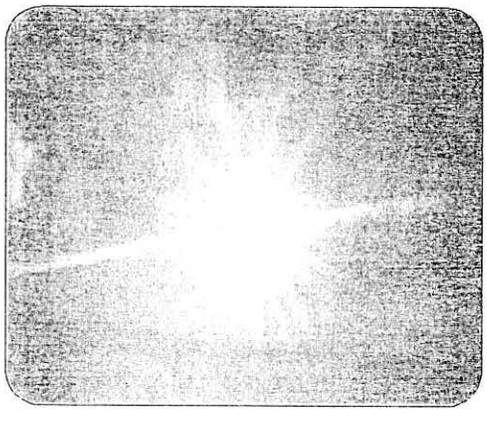
- ***Rainfall data***

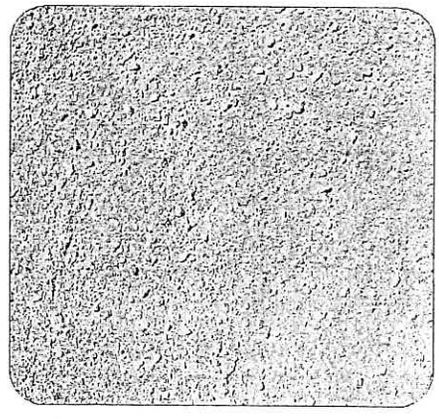
Data from the last 24 hours of a storm event should be required.



The Report

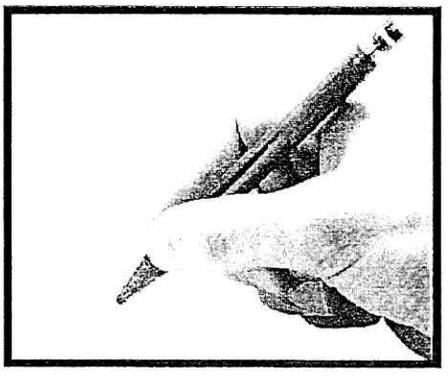
- ***Weather and soil conditions***





The Report

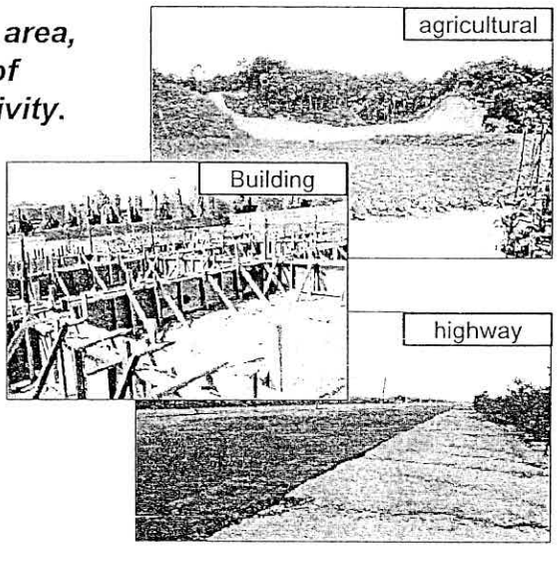
- ***Project name and location***
  - Identify the site in case of a regulatory visit or audit.
  - Be consistent with the project name from inspection to inspection.



The Report

- ***The specific site area, phase and type of construction activity.***

Indicate the potential exposure during this inspection, and which BMPs are installed.



The Report

- ***All relevant BMPs and their operating condition at the time of the inspection.***

Identify the compliance issue and location of BMPs

The Report

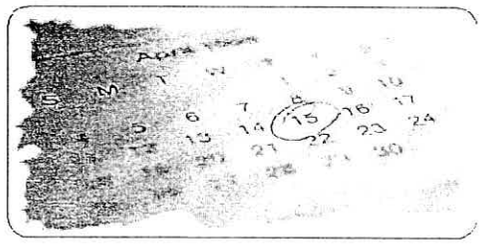
- ***Evidence of previous or ongoing discharges.***

Describe the discharge, and identify the location.

The Report

- ***Corrective Action report***

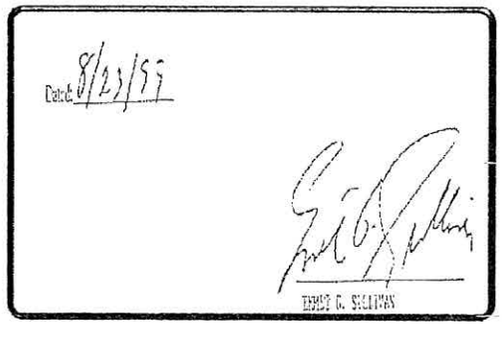
Specify a time by which corrective actions are to be completed.



The Report

- ***Signature and Date***

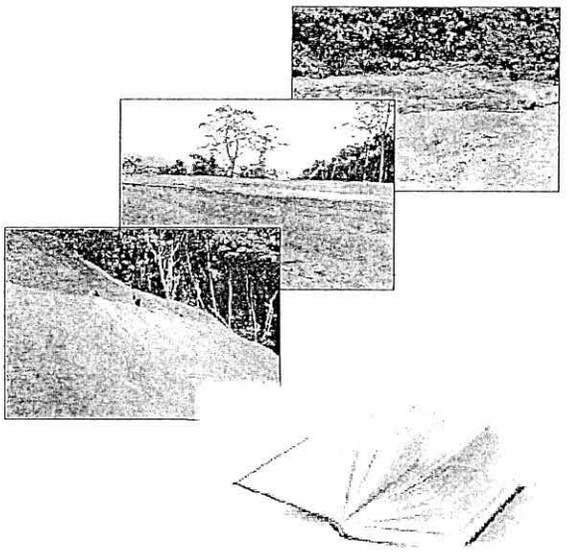
By signing and dating the report you create a historical timetable.



The Report

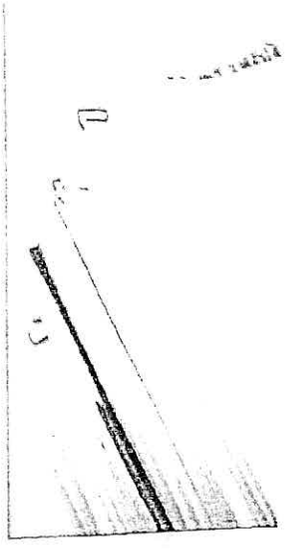
- ***Photographs or analytical reports.***

These may be used to aid in documentation of site conditions with the inspection report.



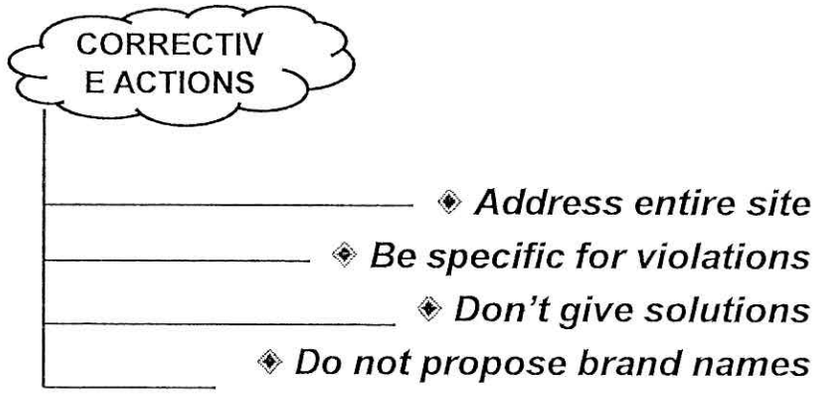
GOOD PRACTICES FOR REPORTING

GOOD PRACTICES FOR REPORTING



- ***Complete and factual records***
  Reports should reflect the actual situation on site.
- ***Support potential enforcement action***
  Report should be clear and factual; enough for an enforcement case in court.
- ***Facilitate***
  Use simple, direct language.
- ***Document what you see, do not speculate***
  Avoid assumptions.
- ***Do not make personal observations about people***
  Only report observations about the site.

CORRECTIVE ACTIONS



EVALUATE PROCESS FOR IMPROVEMENT

1. Periodically evaluate inspection process.

2. Try inspecting in reverse or moving across site differently.

COMPLIANCE PROBLEMS

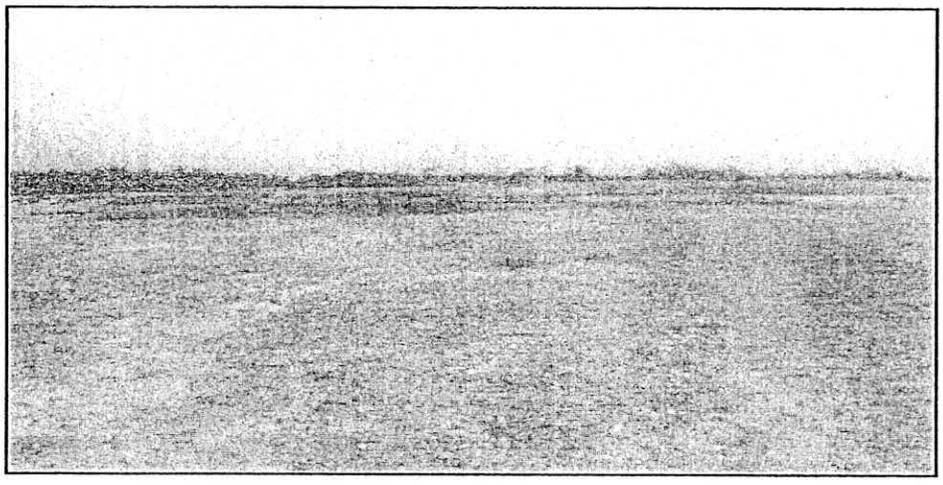
COMPLIANCE PROBLEMS

1. Too much soil exposed at one time
2. Missing and/or misunderstood sediment controls
3. Poor management of temporary stockpiles
4. Inadequate BMP maintenance
5. No BMPs to minimize vehicle tracking onto the road
6. Improper solid or hazardous waste management
7. Dewatering and other pollutant discharges
8. Poorly managed washouts (concrete, paint)
9. Inadequate self inspections of BMPs
10. Inadequate maintenance of ESC Plan

(Source: U.S. Environmental Protection Agency)

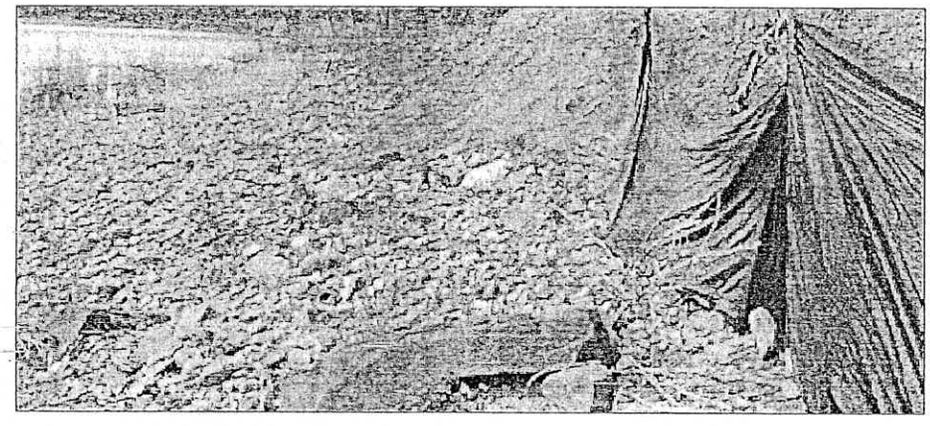
COMPLIANCE PROBLEMS

1. Too much soil exposed at one time



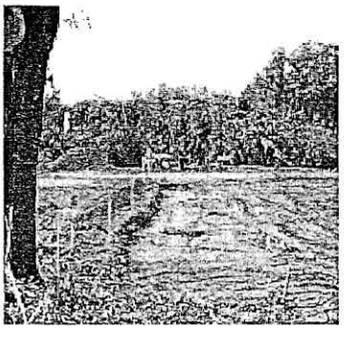
COMPLIANCE PROBLEMS

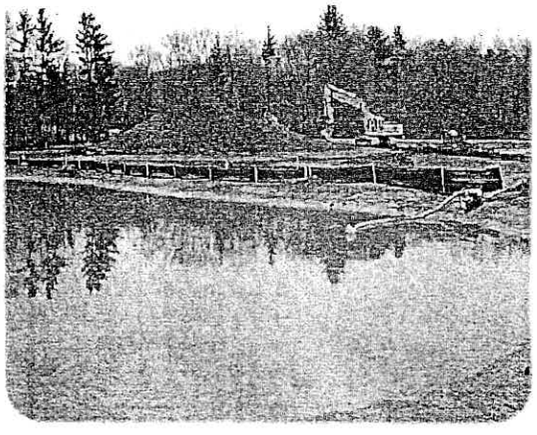
2. Missing and/or misunderstood sediment controls



COMPLIANCE PROBLEMS

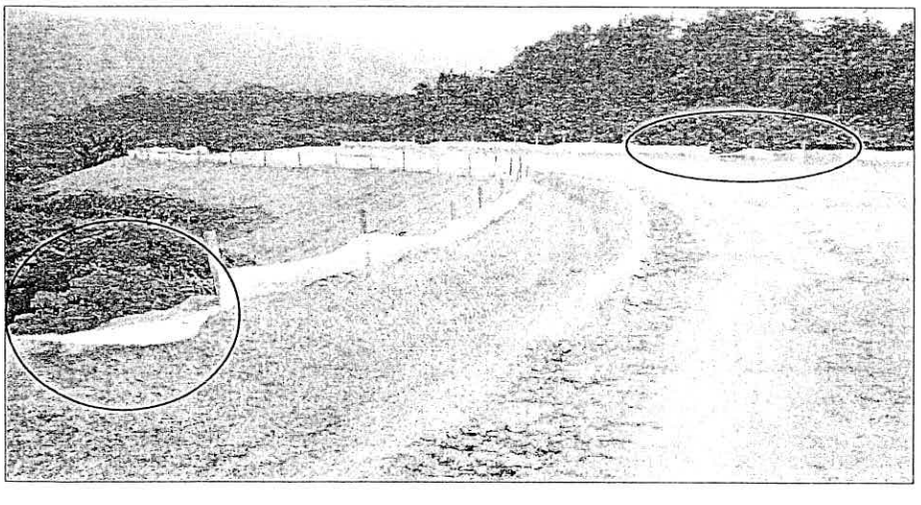
3. Poor management of temporary stockpiles





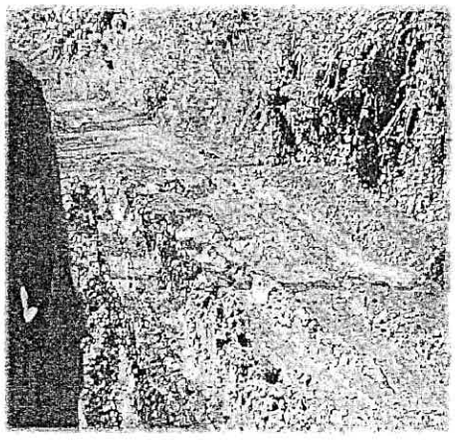
COMPLIANCE PROBLEMS

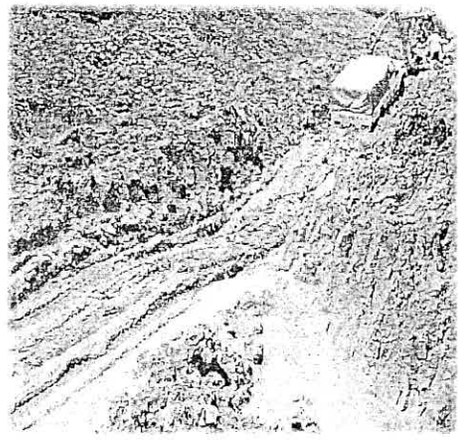
4. Inadequate BMP maintenance



COMPLIANCE PROBLEMS

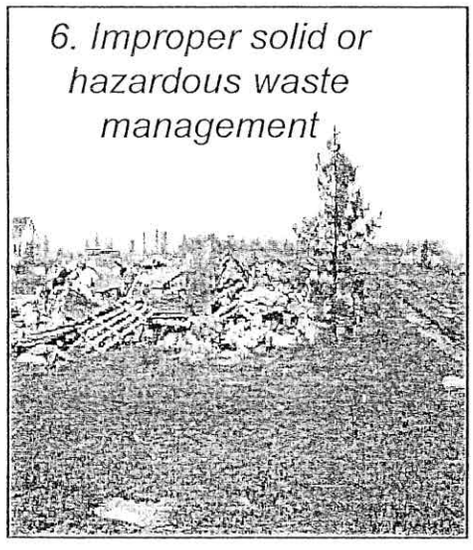
5. No BMPs to minimize vehicle tracking onto the road





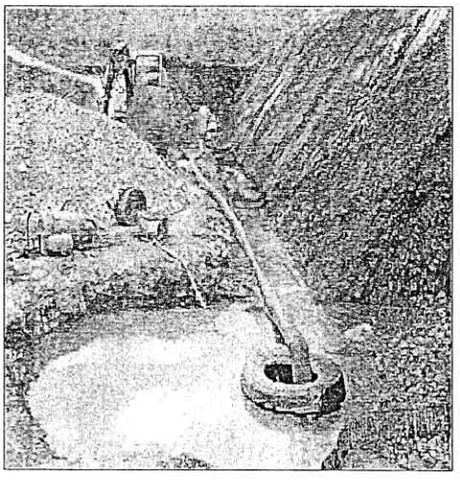
COMPLIANCE PROBLEMS

6. Improper solid or hazardous waste management



COMPLIANCE PROBLEMS

7. Dewatering and other pollutant discharges

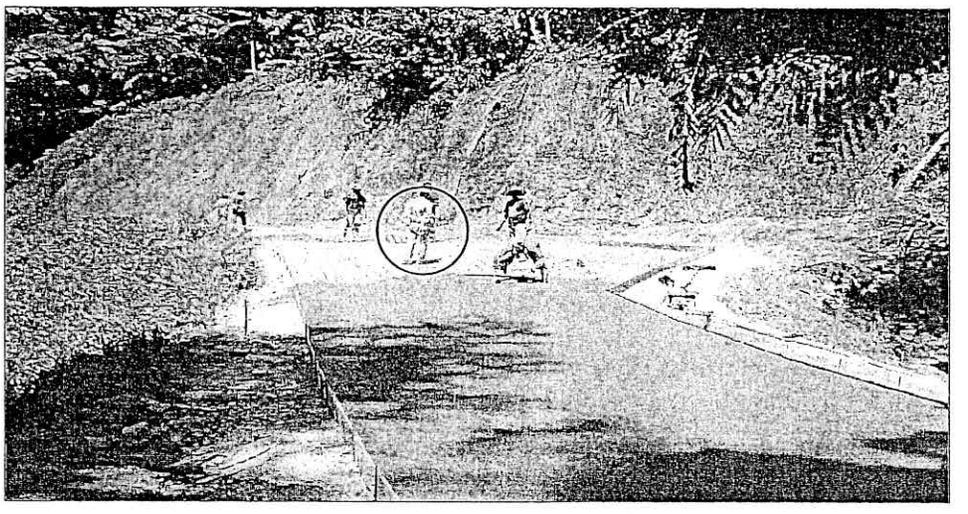


COMPLIANCE PROBLEMS

8. Poorly managed washouts (concrete, paint)

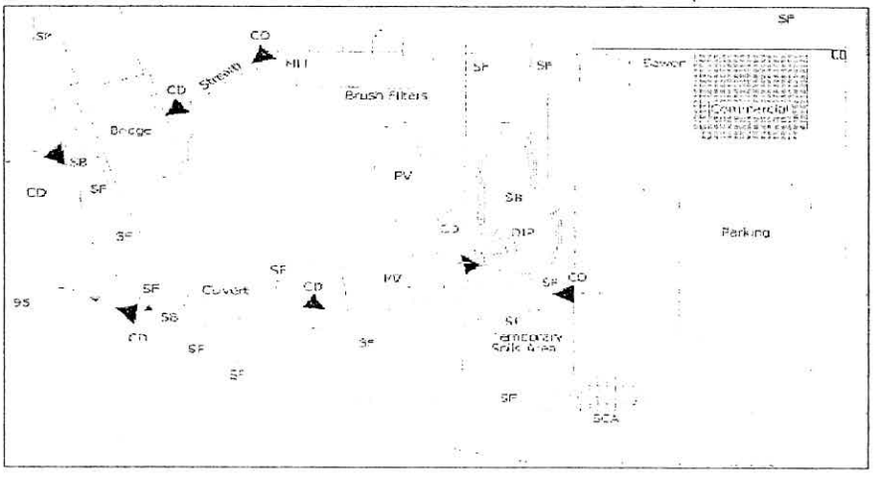
COMPLIANCE PROBLEMS

9. Inadequate self inspections of BMPs



COMPLIANCE PROBLEMS

10. Inadequate maintenance of ESC Plan



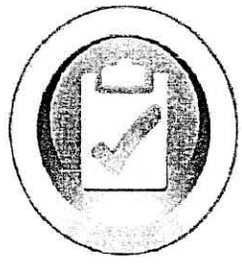
POST INSPECTION PROCESS

Post Inspection Process

- Send copies of the inspection report to all required locations/persons.

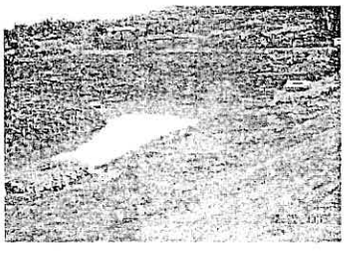
Verification of Corrective Action

- Note corrective actions at every inspection and whether they have been carried out within the required time frame.
- Third Party Inspectors should notify proper regulatory authority where required.

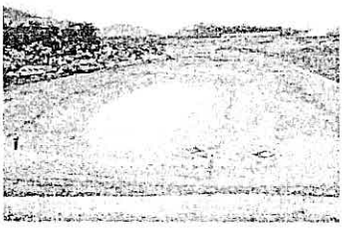


MODULE: SEDIMENT CONTROL BMPs

SEDIMENT CONTROL : SEDIMENT BASIN



A temporary basin with a controlled release structure, formed using embankments or excavation in lower drainage area.



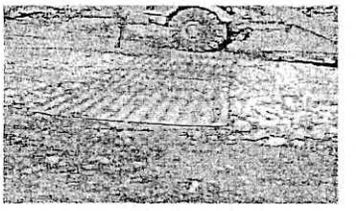
PURPOSE

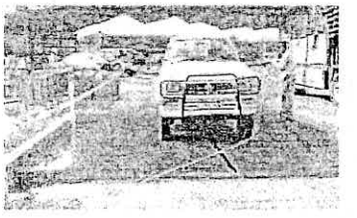
To detain sediment-laden runoff from small disturbed areas long enough to allow most of the sediment to settle out, thus protecting waterways from sedimentation.

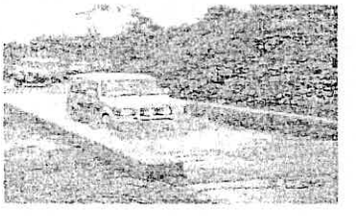
SEDIMENT CONTROL : SITE ACCESS

A stabilized pad located at points where vehicles enter and leave a construction site. May take the form of tracking pads, boards, rumble strips, washes or pool of water.

PURPOSE
To reduce amount of sediment transported onto public roadways by motor vehicles .



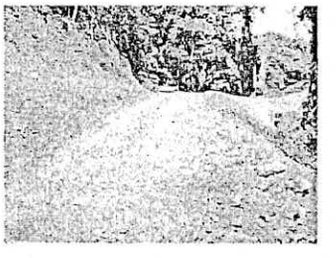




SEDIMENT CONTROL : STABILIZED ROADWAY

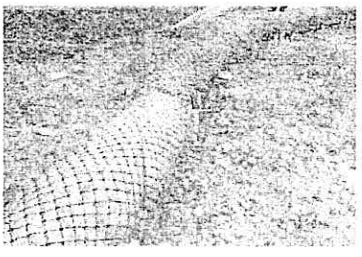
A stabilized temporary access connecting existing public roads to a remote construction area.

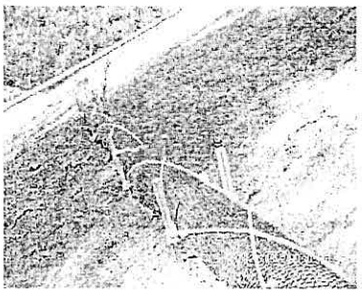
PURPOSE
- To provide a fixed stable route for heavy construction traffic
- To reduce erosion and subsequent re-grading of permanent roadbeds between initial grading and final stabilization.
- To stabilize soils on which a travel way is constructed from rutting by vehicle tracking.



SEDIMENT CONTROL : RFM

A fiber roll or rolled fiber mat(RFM) consists of straw, flax, coconut husk or other similar materials that are rolled and bound into a tight tubular roll and placed around the worksite perimeter and is referred to as wattles when placed on the face of slopes at regular intervals.

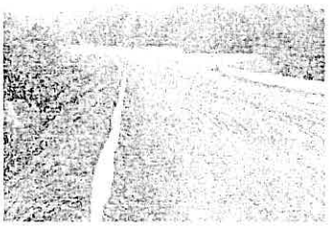


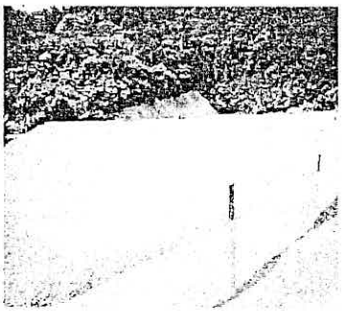


PURPOSE
To intercept runoff.
To reduce runoff flow velocity.
To release the runoff as sheet flow.
To provide some removal of sediment from the runoff

SEDIMENT CONTROL : SILT FENCE

A temporary sediment barrier of woven, geo-fabric stretched across and attached to supporting wood or steel posts.





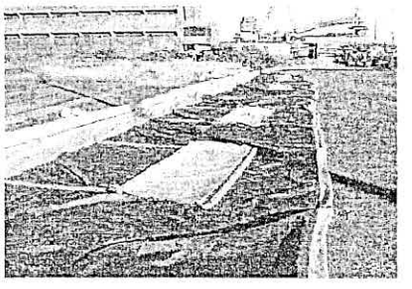
PURPOSE
To prevent sediment-laden runoff from flowing down bare slopes by diverting it to control structures like sediment traps.

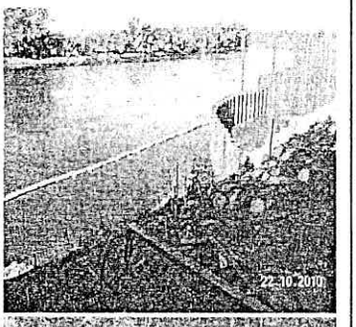
SEDIMENT CONTROL : SILT CURTAIN

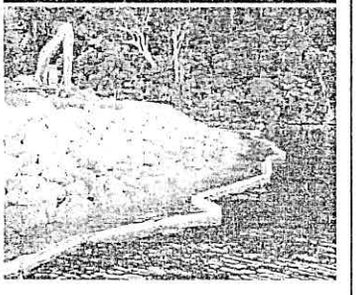
A floating permeable curtain in watercourses
Curtain weighted down to achieve closure while supported at top by floats.

PURPOSE

- To provide sedimentation protection for a watercourse.
- To prevent the migration of sediment from a work site into the larger body of water.







SEDIMENT CONTROL : BRUSH BARRIER

Sediment barrier constructed at the perimeter of a disturbed area or on slope surface from residue materials available from clearing and grubbing the site.

PURPOSE

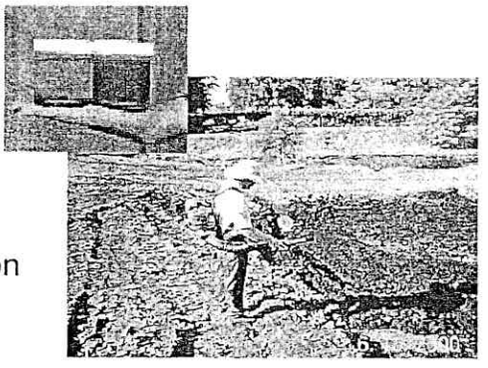
Properly packed and stacked, branch layer placed on berm or terrace step to cover slope as mat.

To intercept and retain sediment from disturbed areas of limited extent .

SEDIMENT CONTROL : ACTIVE TREATMENT SYSTEMS : PAM

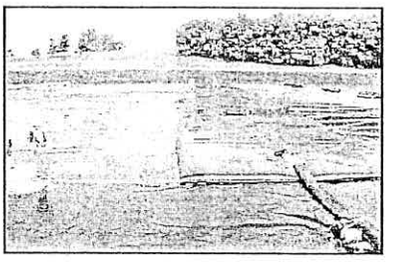
Water-soluble anionic polyacrylamide product in emulsion, liquid, powder and block form. For soil stabilization or to flocculate sediment.

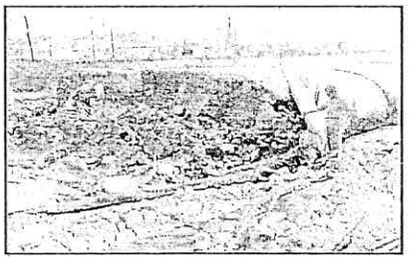
PURPOSE
To bind and stabilize soil particles.
To treat turbid water prior to discharge into receiving watercourse.



SEDIMENT CONTROL : ACTIVE TREATMENT SYSTEMS: GEO-BAGS

Pulsing pump used to pressure geo-tube bag to permeate clear water through container wall (also known as dewatering bag) leaving the sediment cake behind.





SEDIMENT CONTROL : STREAM CROSSING

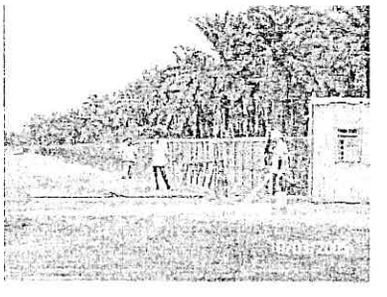
Structure for vehicles to cross waterway during construction eliminating erosion and downstream sedimentation

PURPOSE

- To provide access across a waterway for construction equipment.
- To prevent equipment from damaging waterway, blocking fish migration, and tracking sediment into the waterway

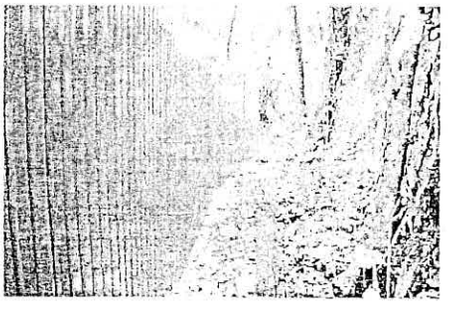
HOUSEKEEPING : SITE FENCING

Approved fencing material for construction sites.



PURPOSE

- To control access to the construction site (safety factors).
- To delineate limits of construction and land disturbing activities.
- To mark site boundary.



HOUSEKEEPING : BOUNDARY MARKER

Marker or flagged area of limits of construction along perimeters of site, stream corridors, or areas for preservation.

PURPOSE

- The areas will be visible and known to all parties in the working area.
- To limit construction activities so that disturbed areas are kept to a minimum.

HOUSEKEEPING : CONCRETE WASHOUT

A designated area for concrete washout.

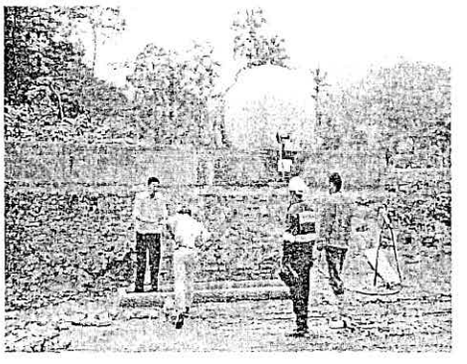
PURPOSE

To minimize discharge of concrete waste that contain high pH (alkaline base slurry) to watercourses.

HOUSEKEEPING : FUEL CONTAINMENT

Vehicle and equipment fueling, maintenance and cleaning to be conducted in designated location.

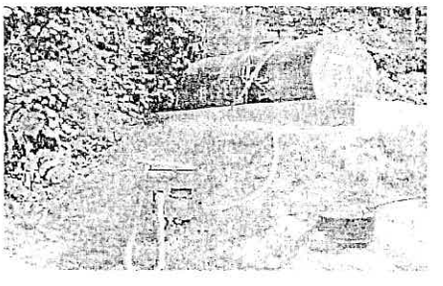
PURPOSE
To prevent fluids used/collected/spills in these processes from entering waterways

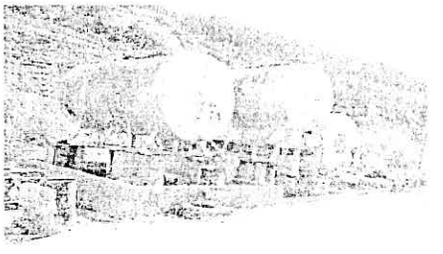


HOUSEKEEPING : FUEL SECONDARY CONTAINMENT

A second containment wall or embankment around petroleum supply tanks .

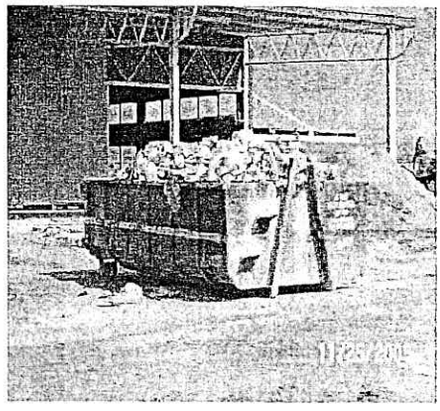
PURPOSE
To failsafe the primary containment (vessel or tank) from leaks or spills into watercourses .





HOUSEKEEPING : SOLID WASTE MGT

Practices to collect and dispose construction waste at designated location and container/trash bin.



PURPOSE

- To prevent littering and mosquitoes breeding.
- To minimize discharge of pollutants such as leachates into watercourses.

HOUSEKEEPING : SPOIL MGT AREA

Area on or off site designated for landfill or disposal of surplus /contaminated/dredged earth (e.g. from sediment basin)

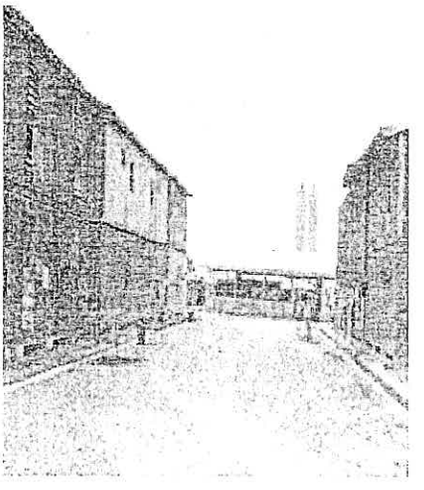
PURPOSE

To mitigate environmental impacts during handling, transportation, stockpiling and disposal of spoil materials

HOUSEKEEPING : STABILIZED STAGING AREA

Area with layer of gravel or crusher run to be used for trailer, parking, storage, unloading/loading and temporary site office.

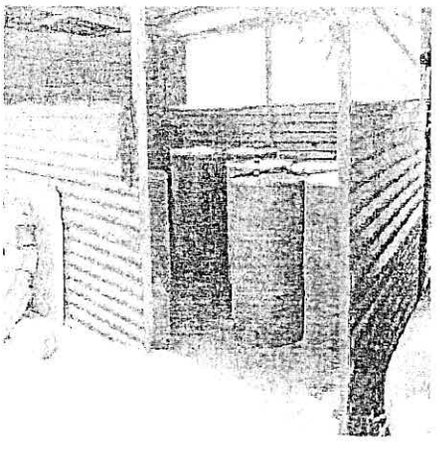
PURPOSE
To prevent vehicles most frequently entering a site from coming into contact with mud.



HOUSEKEEPING : SCHEDULED WASTE AREA

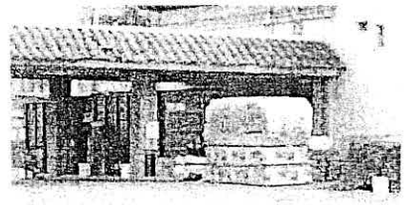
Area for storage of hazardous waste with approved procedures and practices for handling them

PURPOSE
- To minimize discharge of hazardous waste to watercourses.
- To comply to requirements in Environmental Quality Regulation (Scheduled Waste) 1989.



HOUSEKEEPING : STORAGE MGT

Storage area for materials such as chemicals , fertilizers, petroleum products , asphalt , acids, lime, paints etc that may be detrimental if released to the environment.



PURPOSE

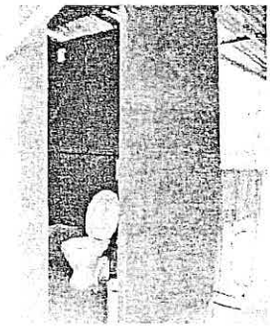
- To reduce pollution potential and dusting from stockpiles.
- To promote good housekeeping practice.
- To protect from storm water run-on using perimeter sediment barrier such as berms, and placing certain materials on pallets and cover.

HOUSEKEEPING : SANITARY WASTE MGT

Provision of temporary toilet/sanitary facilities

PURPOSE

To treat sanitary/septic waste before discharge to watercourses

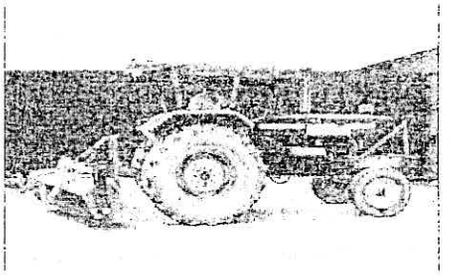


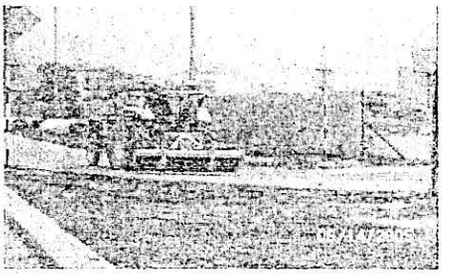
HOUSEKEEPING : DUST CONTROL & CLEANING

Practices to collect and remove tracked sediment from construction site.

PURPOSE

To prevent sediment from entering watercourse and prevent dust on roads.





SITE PLANNING & MANAGEMENT
BMPs

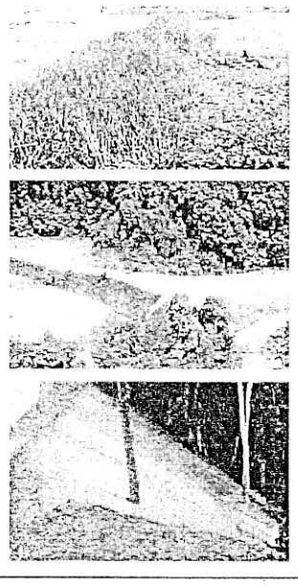
1

SITE PLANNING & MGT :
1.PRESERVATION OF EXISTING TREES AND VEGETATION

The identification and protection of desirable vegetation on-site such as trees, shrubs and plants, native vegetation and natural Vegetated Filter Strips (VFS).

PURPOSE

- To minimize disturbances on construction sites,
- To stabilize soil,
- To trap suspended particles from sheet flow runoff,
- To promote infiltration of storm water.

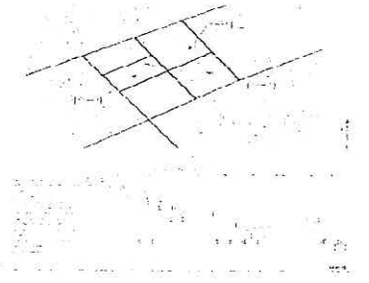


SITE PLANNING & MANAGEMENT : 2.CONSTRUCTION SCHEDULING – PHASING AND SEQUENCING

A specified work schedule that coordinates land-disturbing activities with the installation of erosion and sedimentation control measures.

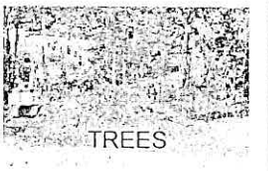
PURPOSE

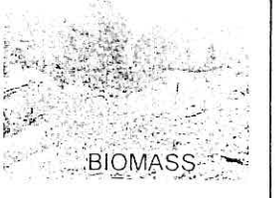
- To reduce on-site erosion and off-site sedimentation by performing land disturbing activities, and installing erosion and sedimentation control practices in accordance with a planned schedule.



SITE PLANNING & MANAGEMENT : 3.STOCKPILE ON-SITE RESOURCES

On-site resources that can be potential material for erosion control such as topsoil, rocks, biomass and existing vegetation stockpiled and use made of existing native vegetation to establish seedbed preparation, grow grass or plant nursery.

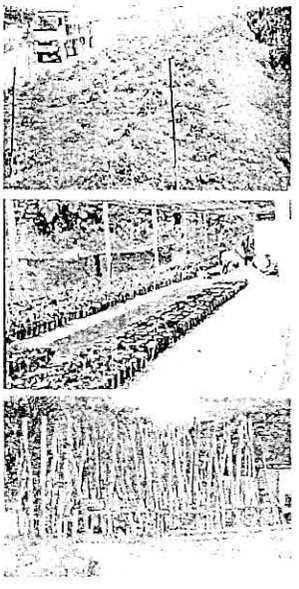




SITE PLANNING & MANAGEMENT: : STOCKPILE ON-SITE RESOURCES

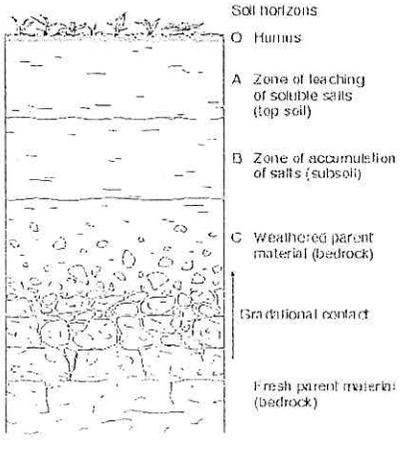
PURPOSE

To make use of existing on-site resources for erosion and sediment control which can not only minimize cost and time in material procurement but also minimize wastage.



NURSERY

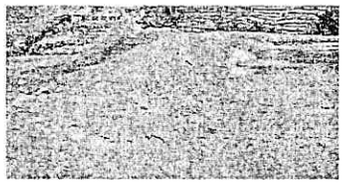
TOPSOIL - the vital component of the Ecosystem



Enables :

- Infiltration and Storage of Stormwater
- Breakdown of organic matter into nutrients for plant growth
- Microorganisms, earthworms etc to facilitate such activities

RUNOFF CONTROL
EARTH BANK/ PERIMETER DRAIN



Temporary berm drain, embankment or ridge of compacted soil, located in such a manner as to intercept, divert and channel water to a desired location.

PURPOSE

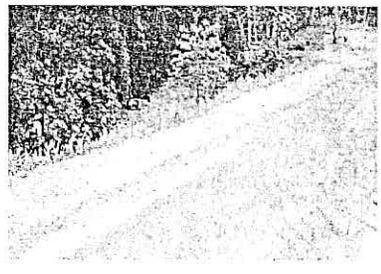
To direct runoff to a sediment trapping device or to direct run-on around the site and away from disturbed areas, thereby reducing the potential for erosion and off site sedimentation.

RUNOFF CONTROL - DIVERSION

Temporary channel of compacted soil constructed above, across, or below a slope, with a supporting earthen ridge on the lower side.

PURPOSE

To reduce the erosion of steep or otherwise highly erodible areas by reducing slope lengths, intercepting storm runoff and diverting it to a stable outlet at a non-erosive velocity, or to convey storm water through a construction site.



RUNOFF CONTROL
LINED WATERWAY (ROCK MATERIALS)

Temporary waterway or outlet with a lining of rock, or other permanent material. The lined section extends up the side slopes to the designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

PURPOSE

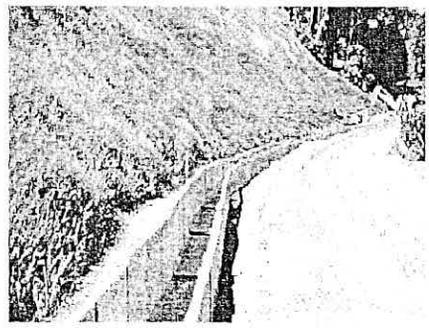
To provide for the disposal of concentrated runoff without damage from erosion or flooding, where grassed waterways would be inadequate due to high velocities.

RUNOFF CONTROL
CATCH DRAIN

Permanent drain running along the side of a road or track or along the base of a cut or fill slope

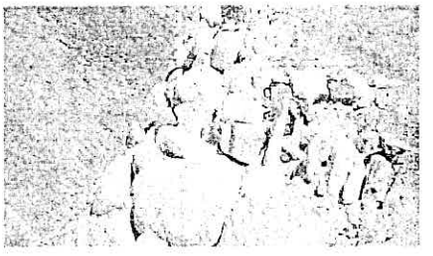
PURPOSE

To collect runoff from the road or track, or from the slope surface to direct the sediment-laden flow to sediment traps .



RUNOFF CONTROL
RIPRAP

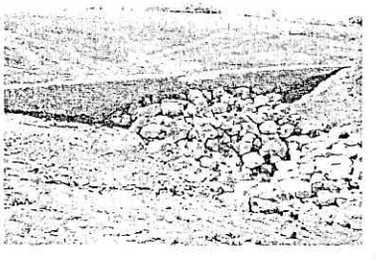
Layer of rocks laid as armoring to protect structures, banks or channel beds.



PURPOSE
To protect structures, banks or stream beds from scour

RUNOFF CONTROL
CHECK DAM

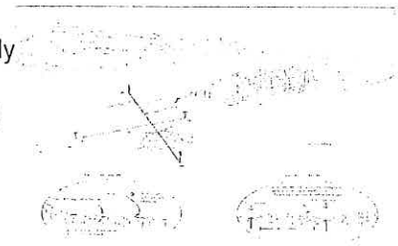
Temporary device constructed of rock, sandbags, or fiber rolls, placed across a natural or man-made channel or drainage ditch.



PURPOSE
To reduce the velocity of concentrated stormwater flows,
To trap small amounts of sediment generated in the conveyances
To reduce scour and channel erosion.
To encourage sediment dropout

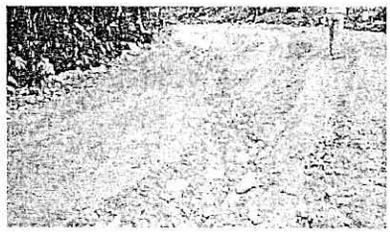
RUNOFF CONTROL INTERCEPTOR DIKE - ROLLING DIP/ WATER BAR

Ridge and channel constructed diagonally across a sloping road that is subject to erosion and may be referred to as rolling dips depending on the features constructed.



PURPOSE

To limit the flow accumulation of erosive volumes of water by draining and dispersing road surface runoff to prevent surface erosion.

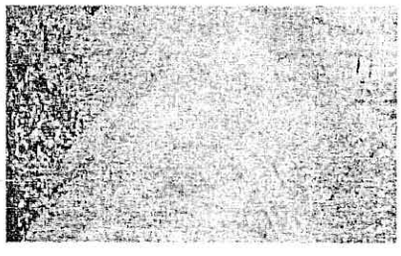


RUNOFF CONTROL - SWALE

Temporary or permanent channel, which may be lined with natural vegetation, synthetic materials, or rock.

PURPOSE

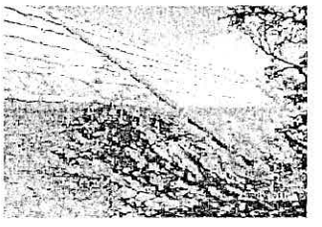
To slowly convey runoff to a discharge point located downstream to minimize erosion, while recharging groundwater and reducing soil runoff. Vegetated or grassed swales also helps capture sediment.

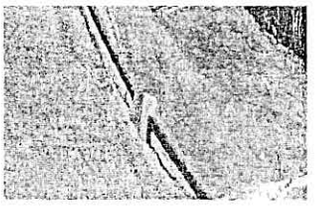


RUNOFF CONTROL- PIPE SLOPE DRAIN

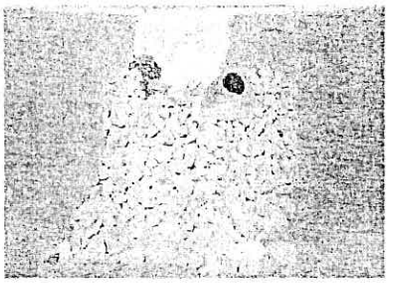
A temporary or permanent pipe structure placed from the top of a slope to the bottom of the a slope.

PURPOSE
To convey storm water runoff down the face of a cut or fill slope without causing erosion on or below the slope.





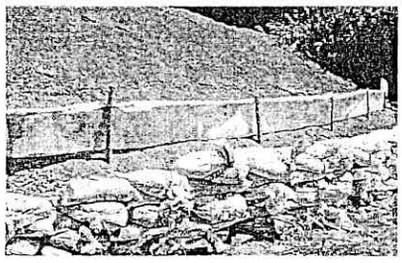
RUNOFF CONTROL - ROCK OUTLET PROTECTION

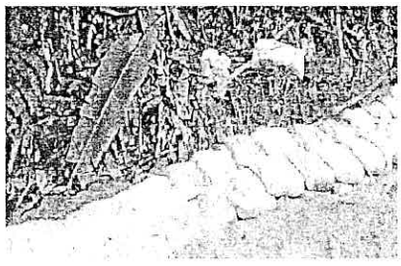


Paved and/or riprapped channel treatment, placed below storm drain outlets or any discharge outlets.

PURPOSE
To reduce storm water velocity and dissipate energy of flow before it enters channels
To prevent scour at storm water outlets and downstream erosion through velocity dissipation.

RUNOFF CONTROL - SAND BAG BARRIER





temporary linear sediment barrier consisting of stacked sandbags placed around site perimeter and active worksite.

PURPOSE

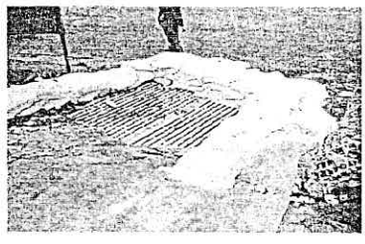
To intercept and slow the flow of sediment-laden sheet flow runoff.

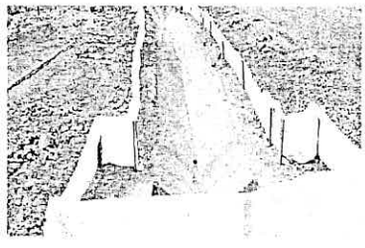
RUNOFF CONTROL - STORM DRAIN INLET PROTECTION

Measures such as silt fence, sandbag, or fiber roll, installed around any storm drain inlet.

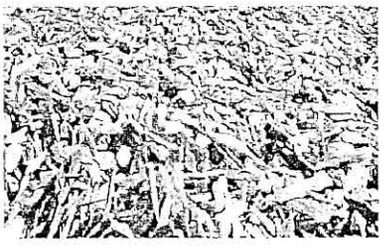
PURPOSE

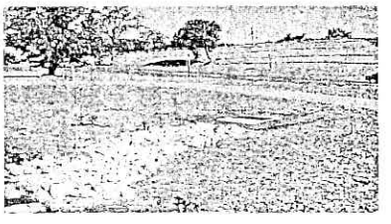
To reduce stormwater velocity and detain or filter sediment-laden runoff to allow sediment to settle prior to discharge into the drain.





RUNOFF CONTROL - MULCHING





The application of plant residues or other suitable materials to soil surface as ground cover. When applying mulch materials with water and glue, the application is referred to as hydromulch.

PURPOSE

To prevent erosion by protecting the soil surface from raindrop impacts and reducing the velocity of overland flow.
To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat.

RUNOFF CONTROL - REVEGETATION

The establishment of temporary vegetative cover with fast growing species for seasonal protection on disturbed or denuded areas.

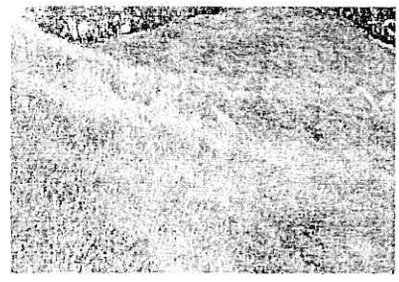
PURPOSE
To reduce runoff velocity and minimize sheet flow
To protect soil surface from erosion
To promote infiltration of runoff into the soil

RUNOFF CONTROL - HYDROSEEDING

Pumping a solution of seed, fertilizer, and mulch to land in one step in order to re-vegetate. May also be called hydromulching if no seed is applied.

PURPOSE

To protect exposed soils from erosion.

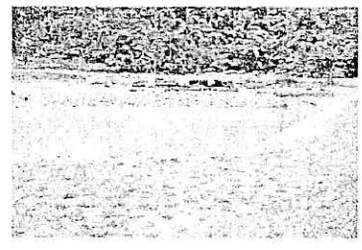


EROSION CONTROL : RIP-RAP SLOPE PROTECTION

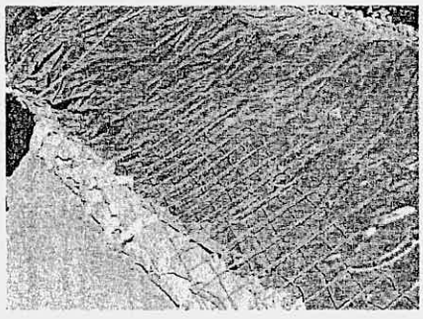
A layer of rock placed on slopes or streambanks.

PURPOSE

To protect the soil surface from erosive forces and/or improve the stability of soil slopes.



EROSION CONTROL : PLASTIC COVER



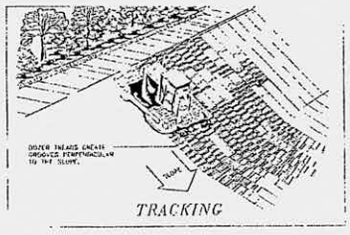
Plastic cover material used in conjunction with weights, stakes or rebar temporarily placed on slopes or stockpiles..

PURPOSE

To be used for temporary soil stabilization by preventing infiltration of surface waters/rainfall onto unstable bare slope or stockpile material.

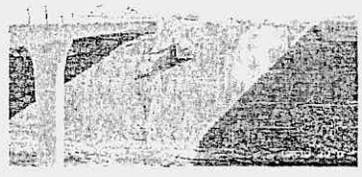
EROSION CONTROL: SURFACE ROUGHENING

The use of mechanized equipment to roughen soil on a bare slope with grooves or terraces that run perpendicular to the direction of the slope.



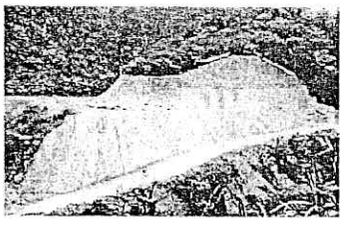
PURPOSE

To loosen compacted soil on a slope that has been cleared and graded, cut, or filled as well as create small grooves or terraces which reduce runoff velocity, trap seed, fertilizer and sediment, and provide more favourable conditions for vegetation establishment



EROSION CONTROL : EROSION CONTROL BLANKET

A protective blanket or soil stabilization mat used to assist in establishment of temporary or permanent vegetation on ~~steep~~ slopes, channels or stream banks.



PURPOSE

To protect soil and hold seed and mulch in place on slopes and in channels so that vegetation can become well established.