MAINTENANCE OF TEMPORARY SEDIMENT CONTROLS

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SUMMARY

During the summer of 1977, field surveys and conferences with Virginia Department of Highways and Transportation district personnel were conducted to determine the statewide status of maintenance efforts in erosion and sedimentation control. As a result of this study two types of problems were identified: (1) field, and (2) administrative and personnel. Eleven field problems and three administrative and personnel problems are cited in the report and solutions are spelled out for each. In addition, four recommendations are offered. One of these calls for the addition of field maintenance techniques to Department specifications; the other three concern the assignment and duties of district environmental personnel to work on erosion and sedimentation control. The need to have a full-time erosion and sediment control specialist in each district is stressed.

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INTRODUCTION

It is axiomatic in the field of engineering that proper maintenance of man's technological devices is the key to optimizing the function and life span of these devices. Investigators in Virginia and a number of other states are learning that prompt and efficient maintenance of sediment control measures is necessary to assure an effective sediment control program. The critical need for such maintenance lies mainly in the nature of the situations requiring sediment control and the type of control methods most commonly used. Temporary sediment controls are most useful during periods of earth disturbance and construction. During such periods the surface configuration and areal extent of the denuded drainage area are constantly changing; cuts are made deeper and fills higher, and natural drainage ways are altered and redirected. These changes make it imperative that close surveillance be maintained and that prompt action be undertaken if proper sediment control is to be assured.

The nature of the controls commonly used to prevent or to intercept sediment also dictates that they receive close attention. Each storm event alters the topography and the microgeometry of the related drainage channels. Intense storms can produce flows which impair the efficiency or destrcy the integrity of control structures. Finally, if the structure is functioning properly, the sediment being trapped constantly decreases the capacity and hence the efficiency of the control.

Despite the growing awareness of the importance of proper maintenance for erosion and sediment controls, little in the way of specific maintenance procedures appears in the literature. Several publications note the importance of maintenance.[1,2,3,4] In a few cases, general specifications are given for cleaning sediment ponds.[5,6]

The purpose of the study reported here originally was to compile the existing maintenance techniques or write a mini-manual on erosion and sediment maintenance procedures. However, during the investigations it was found that many of the common maintenance procedures were already known to field personnel and this fact made a simple manual unnecessary. Most of the serious maintenance problems affecting the erosion and sediment program were due largely to a combination of field technical problems and administrative and personnel problems. It was decided then to try to identify and solve the major problems in these two areas. The specifics of the problems identified are discussed in the following sections.

FIELD MAINTENANCE PROBLEMS

During the summer of 1977, the authors conducted a series of conferences and field surveys with the district environmentalists and sedimentation control specialists. From the information gathered, it is evident that significant improvement has been made in the statewide erosion and sediment control program in the interval since the last statewide survey in 1973.[7] The general awareness and understanding of the technical problems and prospective solutions have expanded at the district level.

However, while progress is evident, many maintenance problems remain totally or partially unresolved. Some of the most difficult involve the identification and implementation of effective maintenance for erosion and sediment controls once they have been put in place. A number of the most common problems, along with suggested solutions, are given below.

1. Problem: Controls are not being cleaned of accumulated sediment early enough to maintain their design efficiencies.

   Suggested Solution: Write into the specifications that all controls be cleaned when sediment fills one-half of their volume capacity as determined by

the District Sedimentation Control Specialist.* This requirement would apply to filter barriers such as straw bale barriers and silt fences and to sediment traps and ponds. (Figure 1.) In cases where it is impractical to clean the controls the District Sedimentation Specialist should have the alternative of specifying that a new control be built, and usually upstream from the old one. (Figure 2.) The sediment trapped by the old control should be seeded over at the same time the new control is placed. Cleaning should be specified as a pay item at 20% of the original price of the control.

2. Problem: Access to clean sediment controls is often lacking, especially for sediment traps and ponds located at or near the base of high fills.

   Suggested Solution: For sediment control structures that are to be cleaned or replaced, the project plans should show access routes to them. In some cases this access route may require the acquisition of additional right-of-way or an easement. (Figure 3.) Again, the District Sedimentation Control Specialist may dictate that a new structure be constructed in lieu of cleaning the old one, with the old structure being seeded and left in place.

3. Problem: Early deterioration of some silt fence fabrics.

   Suggested Solution: Work on filter fabric quality is now under way by D. C. Wyant at the Research Council. The report resulting from this project is targeted to be issued in the summer of 1978 and will include data on the durability of fabrics, including durability under exposure to low and high pH solutions and to ultraviolet light. The Department should then specify only fabrics which have proven to be durable under the conditions tested in Wyant's study. Such a specification will almost certainly eliminate some of the fabrics now in widespread use, and should eliminate the problem of fabrics deteriorating after only a month or two of exposure in the field.

*Note: See recommendation 1 under Administrative and Personnel Problems Section concerning proposed title.

Figure 1. Silt fence filter barrier filled with sediment. Trap efficiency is greatly reduced.

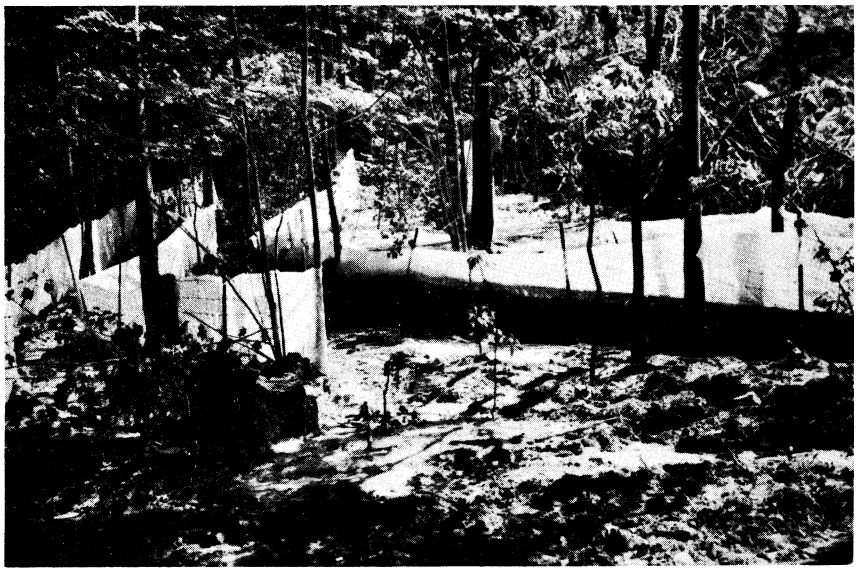

Figure 2. In areas where the cleaning of controls is costly or impractical, new barriers can be placed parallel to the old as seen here.

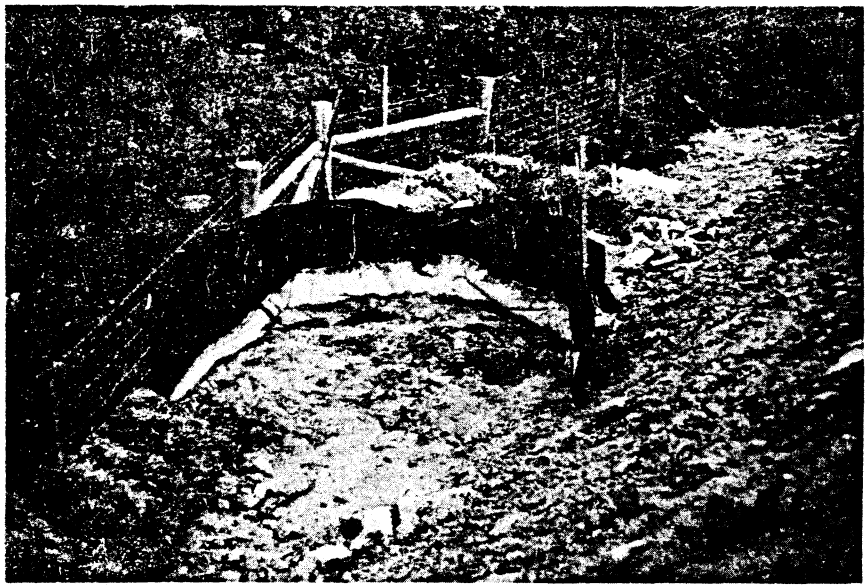

Figure 3. Filter fabric silt fence working well. However, lack of access for equipment will likely make cleaning of fence difficult and costly.

4. Problem: Slow reaction time by seeding contractors.

Suggested Solution: The Department should consider taking over the seeding operation on state and other small construction jobs. This operation can be done by making one or more hydroseeders available to each District Sedimentation Control Specialist.

On large projects the Control Sedimentation Specialist should notify the contractor of the existing specifications on when to seed. If the contractor does not seed the area specified within one week, then a predetermined penalty of X dollars per day should be levied against the contractor, and if the area is not seeded within two weeks, the project should be closed down. (Figure 4.)

5. Problem: There appears to be a high failure rate for straw bale barriers throughout the state.

Suggested Solution: Filter fabric silt fences should be used in place of straw bale barriers in most cases, because prices are comparable, straw and hay are in short supply, and filter fences usually trap sediment more efficiently. In cases where bale barriers are used, they must be constructed according to specifications, being either entrenched or soil sealed, and must be inspected and repaired after each storm event.[8] (Figure 5.)

Figure 4. Rill erosion on a cut slope resulting from lack of vegetative cover. Early seeding will usually eliminate this type of slope erosion.

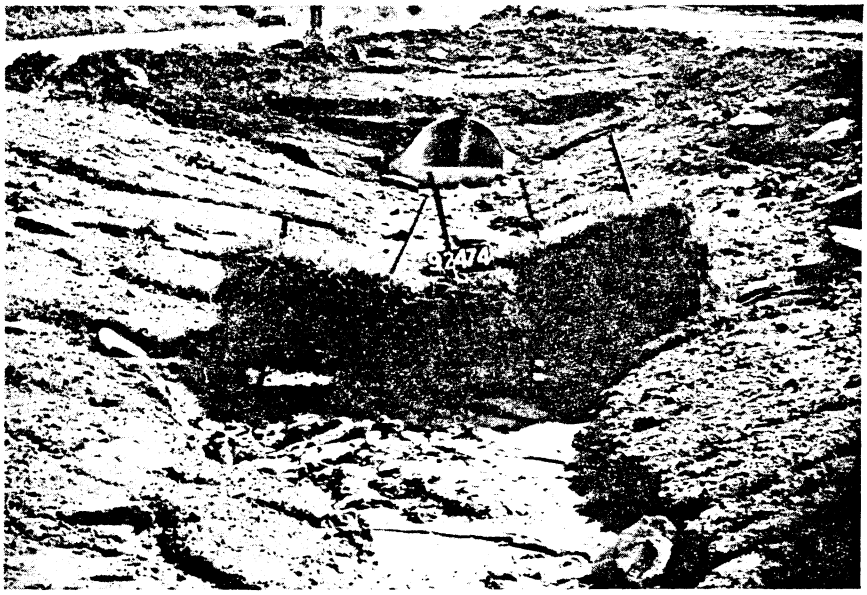

Figure 5. Severe erosion and sediment loss caused by undercutting of a straw bale barrier. Proper installation of this type of barrier will minimize failures of this type.

6. Problem: Cellulose wood fiber is generally considered to have limited effectiveness as a mulch on seeded areas.

Suggested Solution: The Department should eliminate the use of cellulose fiber mulch and replace it with straw mulch tacked with asphalt or cellulose fiber on all steep slopes and other critical areas.

7. Problem: There is a high degree of resistance to temporary seeding on the part of many contractors.

Suggested Solution: The following is taken from the Department's construction manual:

> "When the grading operation is suspended for more than 15 days in an area to be regraded (uncompleted cut slopes, fill slopes, and topsoil stockpiles), that area is to be fertilized, seeded, and mulched with a mixture specified on the Roadside Development Chart for that time of the year."

This is a clear statement that temporary seeding is required in areas where grading is to be suspended for over 15 days. A clear reminder to the contractor that close adherence to this policy will be maintained should eliminate the problem.

8. Problem: A great deal of the brush, vines, stumps, and root mat useful for erosion and sediment control is being burned or hauled away from right-of-ways undergoing clearing and grubbing.

Suggested Solution: All brush, vines, stumps, and root mat should be retained on the job and used for erosion and sediment control. Field observation has shown that a brush barrier composed of limbs and brush alone does not provide the degree of sediment trapping efficiency that a mixture of brush, root mat, soil, etc., does. These mixtures can be bulldozed in windrows downhill from fills and other construction in the same manner as brush barriers are placed today. (Figure 6.) Excess brush could then be stockpiled on the job to be spread later over highly erosive areas, particularly the lower portions of fill slopes.

Use of brush, vines, and root mat in this manner would not only provide increased erosion and sediment control, but would eliminate hauling and other disposal costs. Also elimination of burning would improve ambient air quality.

Figure 6. Brush and root mat barrier windrowed at the toe of a fill.

9. Problem: Some drain pipes under fills extend below the grade of the existing land surface. This placement causes sediment to back up into the pipe, if sediment control barriers are placed downstream. (Figure 7.)

   Suggested Solution: Raise drain pipes under fills to grade or slightly above grade of the undisturbed terrain. (Figure 8.) This placement would allow use of sediment barriers and traps at the outlet end of the pipe without backup and accumulation of sediment into the pipe. A slight raising of the inlet end of the pipe would also allow construction of sediment traps at the inlet end to remove sediment prior to its entering the pipe.

10. Problem: Use of rocks in the bottom of sediment traps makes it necessary to clean traps by hand. Cleaning by hand is inefficient and costly.

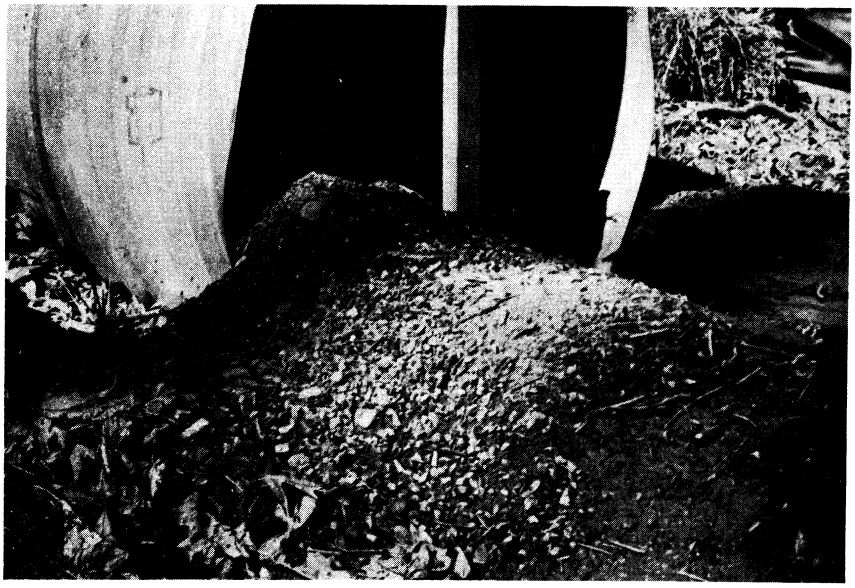

Figure 7. Accumulation of sediment in drain pipe at outlet end. Placing pipe at a slightly higher elevation would help eliminate this harmful buildup of sediment.

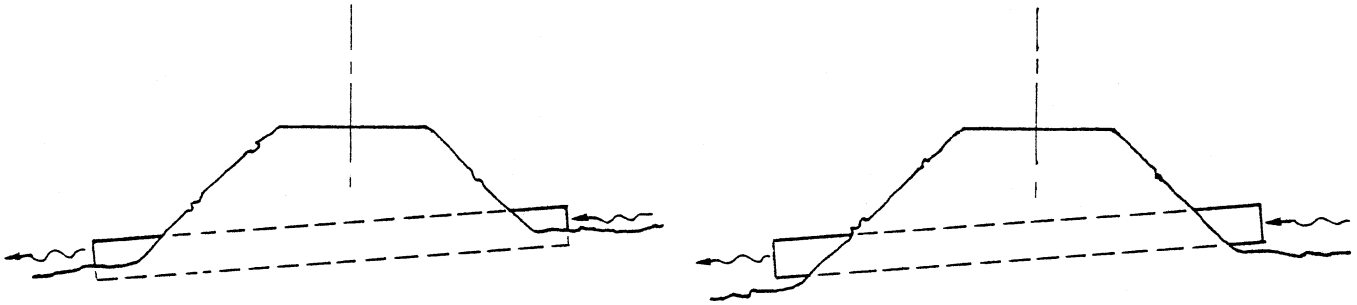

Figure 8. Present and proposed placement of drain pipe under fills.

Suggested Solution: All sediment traps and ponds should be constructed with soil bottoms. This practice would allow the use of mechanical equipment for quick and efficient cleaning and add additional storage capacity in the traps or ponds.

11. Problem: Berms and downdrains are not being reconstructed at the end of each working day on fills undergoing active construction.

Suggested Solution: In areas undergoing active construction, berms and downdrains should be formed and checked at the end of each work day (Figure 9) as stated in Section 303.01 of the Department's Road and Bridge Specifications (1974). This procedure will require the full cooperation of the construction inspector, since the District Sedimentation Control Specialist cannot be present at every job. The same level of inspection should be required after each rain event so that the necessary repairs and alterations can be made. (Figure 10.)

ADMINISTRATIVE AND PERSONNEL PROBLEMS

While some problems in maintaining erosion and sediment controls can be isolated and solved by improved technology, most of the problems are interrelated with other aspects of the Department's overall erosion and sediment control program. Given this relationship, administrative and personnel policies at all levels become critical to erosion and sediment control. A number of administrative and personnel considerations which adversely affect the maintenance program were recognized during the course of this study.

1. Problem: Need for an official position titled "Sedimentation Control Specialist". The duties, responsibilities and authority of the position should be clearly spelled out.

Suggested Solution: The position of "Sedimentation Control Specialist" should be officially established, and the duties, responsibilities and authority of the position should be specified. It is recommended that the job description include the following items: (a) a clearly

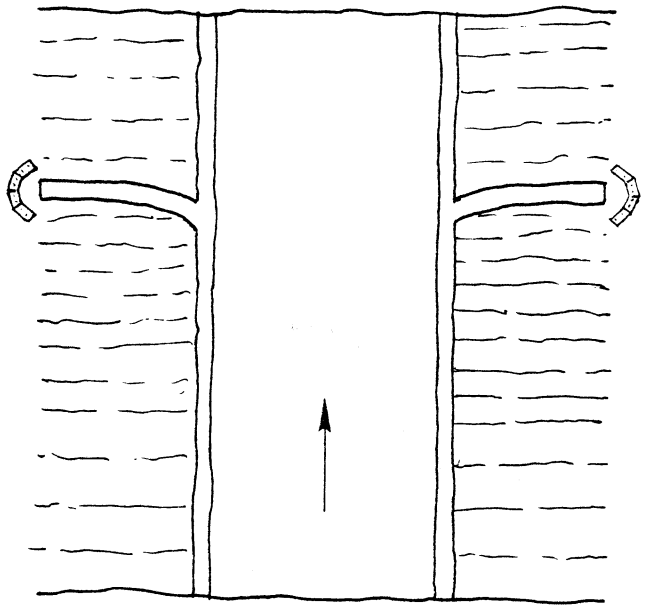

Figure 9. Plan view of fill being constructed. Note the berms at edge of fill and the temporary downdrains.

Figure 10. Erosion attributable to a lack of inspection on berms and down drains.

defined line of communication to project engineers and inspectors, (b) an obligation to accompany field inspections and make on-site recommendations regarding the type and number of needed erosion and sedimentation controls, (c) the authority to change erosion and sedimentation controls in the field as pay items, (d) need to photographically document and keep notes on the erosion and sediment control effort for each construction project and use this information to educate inspector and contractor personnel, and (e) responsibility for the educational effort involving erosion and sedimentation control within the district.

2. Problem: Lack of sufficient environmental personnel at the district level.

Suggested Solution: Every effort should be made to fill the vacant environmental positions existing at the district level. Each district should have three environmentalists as follows:

Environmentalist C - Environmental Coordinator

Environmentalist B, Environmentalist A } Either of these positions could be filled by the District Sedimentation Control Specialist.

Only three of the eight districts had these positions filled during the summer of 1977. When the positions are filled, one person should then function as the District Sedimentation Control Specialist. In the three districts having full-time sedimentation specialists, it was noted that the level of the erosion and sedimentation control effort and maintenance of these controls were distinctly higher than in districts without sedimentation specialists.

Over one-half of the construction districts now have only one environmentalist. This individual

is expected to carry out the entire environmental effort for the district. He cannot do this, if proper attention is to be directed to all aspects of the Department's environmental program. Usually in such cases, the pressing need for input for environmental impact statements and other information forces erosion and sediment control and maintenance into a minor role. Therefore, it is imperative that each district fill these three positions, and that one of the three be a full-time Sedimentation Control Specialist, if proper placement and maintenance of erosion and sedimentation controls is to be accomplished.

3. Problem: Need for statewide coordination of erosion and sedimentation control efforts and exchange of information between districts.

Suggested Solution: Once every year a one- or two-day meeting of all District Sedimentation Control Specialists should be held at a central location or at a district office. The meeting should be coordinated by the Environmental Quality Division. The meeting program should include informal presentations on recent developments in the field of erosion and sedimentation control, idea sessions, new techniques in erosion and sediment control, and informal discussions. The Research Council would provide resource materials and program participants if requested.

Another possible mechanism for exchanging information on erosion and sedimentation control might be a newsletter. At predetermined intervals, perhaps each quarter, an easy to read newsletter should be prepared by the Environmental Quality Division. Again the Research Council would be available for contributions involving recent research findings. The newsletter might include such items as recent developments, helpful hints, research in progress, and personnel news involving persons working in erosion and sedimentation control and related environmental areas.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, it appears that the proper maintenance of erosion and sedimentation controls is an integral part of the Department's erosion and sedimentation control program and cannot be divorced from the overall effort in this area. It also appears that the effective maintenance of erosion and sedimentation control structures is dependent upon corrective action in two distinct areas — (1) field or technical, and (2) administrative and personnel.

Specific recommendations resulting from this investigation follow.

1. Incorporate the field or technical maintenance suggestions spelled out in this report into the specifications of the Virginia Department of Highways and Transportation.

2. Fill existing environmental staff vacancies at the district level as soon as possible.

3. The person filling one of these positions should be designated full-time District Sedimentation Control Specialist and should be responsible for the district's total erosion and sedimentation control effort.

4. Clearly spell out the duties, authority, and responsibilities of the District Sedimentation Control Specialist.

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5. Fairfax County, Virginia, "Erosion-Siltation Control Handbook", Design Review Division, Department of County Development, Fairfax County, Virginia, 1972, pp. 8-20 and 8-23.

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