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WASTEWATER TREATMENT AND DISPOSAL SYSTEM
FIELD INVESTIGATION REPORT
BIG SKY, MONTANA
MAY 1994

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2.0 RESULTS OF FIELD VISIT

2.1 DATA COLLECTION

EH&A has collected on-site original treatment plans and specifications, a discharge permit application with response correspondence, newest proposed State of Montana non-degradation policy, additional sampling data including stream data upstream, mid-stream and downstream from the treatment facilities, current BOD loading levels into and out of the treatment ponds, and the draft copy of the Facility Plan by HKM Engineers. Equipment nameplate data was noted; information on the irrigation system and operation, as well as pictures, were all collected in the field. EH&A has requested receiving stream flow data available and blower nameplate and curve data. Data collected will be used for the development of the IAWP and the development of Engineering Plans and Specifications.

2.2 FIELD OBSERVATION

During the field visit in conjunction with review of data collected the following observations were determined correlating to problems associated with the wastewater treatment facility:

2.2.1 Original Wastewater Treatment Facility

The existing wastewater treatment plant does not appear to have been built in accordance with the original plans. The proposed plant would have provided more extensive treatment than is currently found. Unconstructed treatment facilities include a flocculation-settling and filtration package, an additional aeration zone, chemical addition with associated piping, pumping and backwash equipment. With these unconstructed facilities, the problems associated with the leaching from the storage ponds may have been lessened or avoided.

2.2.2 Aeration Facility

The existing aeration pond was observed to be inadequate to support proper oxygen loading for BOD removal. Large areas of the pond receive little or no aeration. Those areas that do receive aeration receive an insufficient amount to provide adequate oxygen exchange. We observed that most of the air from the blower is being fed through a valveless line which blows air through the chlorine contact chamber. This air is not used for mixing below the water level, but rather is forced ventilation of the air space above the water surface level. The air header line to the chlorine contact chamber should

be fitted with a butterfly valve to reduce or eliminate the air going through the contact chamber, thereby increasing the air going to the aeration pond.

2.2.3 Inadequate Irrigation System

Field observations determined that less than 50 percent of irrigable land is actually being irrigated. Golf course staff discussed the reduced spray patterns, undersized irrigation line sizes and reduced pressures and other inadequacies of the system. The intermediate hydroneumatic tank and booster pumps are unnecessary and are currently poorly operated, e.g., rusty tankage, leaking pump packing, and one pump which operates constantly and at times against a dead head (that is, with no water passing through it), contributing to pump wear and unnecessary electrical expenses.

2.2.4 Pond Seepage

Field observation of pond seepage was somewhat uncertain. No field testing was accomplished to determine existence or extent of seepage.

2.2.5 Inflow and Infiltration (I/I) Study

Currently, District No. 363 is cleaning and TV monitoring all wastewater collecting lines. The results of the monitoring have been used to determine and reduce large producers of I/I. Big Sky recognizes the large influence I/I has on its influent wastewater flows. Aggressive action should be made to reduce I/I effects. It is important to point out that under the Compliance Order, the IAWP needs to describe methods of reducing I/I. The work generated from the TV monitoring and subsequent measures taken will be incorporated into the IAWP.

3.0 INTERIM ACTION WORK PLAN

The Compliance Order requests an Interim Action Work Plan to "describe measures to be implemented immediately...." The objective of the IAWP will be to satisfy the requirements by the State of Montana in its Compliance Order to Big Sky so as to remove the development moratorium. It is important for scheduling that Big Sky obtain full cooperation by the State. The approach to the IAWP will be to show the State that Big Sky recognizes a problem in the seepage from the storage ponds and that they want to address the problem immediately. The IAWP must also incorporate Big Sky's anticipated water conservation program, water saving ordinances and retrofits, and a plan to reduce I/I. Since District No. 363 is currently working on a conservation plan plus new water saving ordinances, this can readily be incorporated into the IAWP. I/I is currently being determined and reduced. A complete description of those measures being implemented and any anticipated measures should be included in the IAWP. Finally, it would be appropriate to try to initiate improvements to the golf course irrigation system. Golf course irrigation improvements and expansion will help relieve the storage ponds, while facilitating better aesthetics of the golf course, and may become an important element in future development and increased treatment plant expansion. The IAWP will develop a plan of action which will correlate with the long term facility plan. Facilities used to satisfy the State in the IAWP should also be a first phase development for the long term development as outlined in the Facility Plan.

3.1 POND LEACHING ALTERNATIVE SOLUTION

The Compliance Order objects to the leaching from the storage ponds into state waters. The first solution investigated for compliance was to line the ponds with impermeable materials to eliminate the problem. Although this appears to be a viable alternative there are difficulties associated with this solution.

The ponds are used for storage of all wastewater during approximately 240 winter days, when irrigation of the golf course is impossible. I/I is very high and reducing I/I will take a considerable time to implement. Pond lining immediately will require not just the lining of the existing ponds, but the construction of a new, lined pond similar in size to the large storage pond to handle all the flow for the 240 storage days. This is costly and may not readily correlate to the long range facility plan.

A second alternative is to construct a package treatment plant. A package treatment plant can be located after the aeration ponds and before the existing chlorine contact chamber and storage ponds. The aeration pond will function as a primary equalization pond to initially counteract I/I and to

equalize BOD loading to the treatment plant. Additional calculation of proper aeration volume, location and quantity of air diffusers will be reviewed as part of the IAWP. This alternative will provide quality treated effluent into the storage ponds. The ponds will therefore not be a part of the treatment process but be considered as holding ponds. The plan will include an intention of operation whereby both the storage pond and the trout pond will be emptied during the irrigation season and then available for storage during the non-irrigation season. Leaching from the pond will continue, as will irrigation. The IAWP will propose a 250,000 gpd plant that can be expanded in the long range facility plan with the addition of a parallel treatment train. It is important to understand that with an IAWP, District No. 363 will still not be in State compliance with a discharge through the ponds to State water and either an administrative approval or permit approval will be necessary to continue to allow the ponds to leach.

There are basically two types of treatment methods considered for the IAWP: Sequence Batch Reactors (SBR) and conventional extended aeration plants. Historically, conventional extended aeration plants have been used. Recently, SBRs have been introduced. Both systems can adequately treat Big Sky's wastewater. The construction cost will be comparable and both systems require about the same amount of space and operating costs. There are two primary differences between conventional package plants and SBR as they relate to Big Sky. If a plant is to be constructed, this season the SBR has a package delivery schedule 6 weeks longer than the conventional system. Because time is very important 6 weeks is a considerable amount of time. In addition, an SBR is not a flow through process. Though there are the means to automate an SBR, in general, the sequencing requires an operator very familiar with operation. The conventional system has a relatively easy operation and are most often used in locations where it is difficult to find experienced operators.

The IAWP will discuss that once the package treatment plant is operational, monitoring of the effects of the treatment plant on the surface water quality and ground water quality will be performed through continued stream sampling above, mid and below the storage ponds, and continued ground water monitoring through the wells. The IAWP will discuss the importance of having immediate improvements not only to clean up the ponds, but also to provide a period to study the effects of the interim treatment plant on discharging water quality to both the State surface waters and ground waters to make adjustments for the long range facility plan and to properly incorporate the results of the I/I program and conservation program into the long range plan.

The use of a package treatment plant will generate a sludge-handling problem not currently being addressed. The process train will include a digester for the sludge treatment plus miscellaneous piping and pumping. Sludge management and disposal can be accomplished by either treatment, offsite

disposal or on-site storage. Treatment would require costly equipment and operation, additional land and local disposal or a fertilization contract. If simple off-site disposal is used, the sludge will need to be disposed of in an approved site. An approved site exists north of Bozeman, creating a considerable expense anticipated for hauling. Sludge could be stored on-site. By simply closing off an end of one of the storage ponds and lining it, a sludge holding pond could easily be created at minimal cost and operation. However, it may take longer to permit a sludge holding pond. In the interim condition it may be advisable to construct a sludge storage tank and dispose of sludge off-site. EH&A will review this option in preparation of the IAWP.

3.2 SCHEDULE

Attached is a fast tract schedule showing the construction of a conventional extended aeration package plant this season with final construction ending mid-November. In order to meet this schedule, multiple items must occur in the time frame shown, and even at that, construction will extend into November. As an alternative, a second schedule is shown, providing approvals and procurement of equipment this season with construction beginning next season. The alternative schedule is an easier schedule to maintain and may be more realistic from a State approval standpoint. An SBR will have a 6-week-longer delivery time than shown and therefore one could extend the overall schedule by 6 weeks for an SBR plant. Engineering and construction of the SBR will be the same as for the conventional plant. It is uncertain how long is necessary for state review. It is important in the submittal of the IAWP to stress to the State the need for immediate action in terms of socio-economic development for the community of Big Sky. For the purpose of the attached fast tract schedule, a 6-week State review and approval process is assumed. The fast tract schedule reflects a very tight time line requiring all portions of the time line to occur as shown to prevent any delays. The procurement of treatment equipment is shown to occur prior to State acceptance. This is acceptable on fast tract scheduled projects because, if something changes within about the first month in the procurement process, the equipment vendor has only lost shop drawing time, not actual equipment construction. However, there is an obvious limit as to how long the vendor can be delayed before significant costs will be incurred. Also, State criteria requires a 30 day bid duration; however, at the direction of District No. 363 a two-week duration is being considered with the belief that the State will honor an emergency with a shorter bid schedule.

In general, the treatment equipment will have the longest deliverable time and will need to be pre-purchased if construction during this summer season is to be done. A preliminary engineering

report will be completed with the treatment design to be sent to the Department of Health and Environmental Sciences of the State of Montana for approval in response with the IAWP of the Compliance Order. Emphasis will be placed on the need for immediacy. Once accepted by the State, procurement documents with performance, specifications will be developed, and the treatment equipment bid and awarded. While the treatment equipment is being constructed, the design and construction of the infrastructure will be done in preparation of the delivery and installation of the treatment equipment. Some additional infrastructure construction will need to be made after installation of treatment equipment. The total schedule will take 6½ months, again assuming a 6-week review and approval schedule by the State. Although the Compliance Order requests all facilities to be constructed in order to meet the requirements of the State, it may be beneficial to discuss with the State the lifting of the moratorium based on good faith of response to the Compliance Order prior to construction or possibly a contract with the wastewater treatment equipment vendor confirming financial commitment to the IAWP.

3.3 COST

The initial budgetary estimates are shown below. These costs reflect a 250,000 gpd package plant without filtration and meeting limits of 10 mg/l BOD5, 15 mg/l TSS and with nitrification, and denitrification. These costs assume the use of the existing chlorination system and pump station will be incorporated into the proposed treatment train as is. The cost also includes professional design fees. A proposal for engineering services will follow this report.

1) Equipment: Single treatment train with interconnecting piping, anoxic zone, aerator, clarifier, digester, controls, blowers, and pumps, plus delivery.

Cost $600,000

2) Building: Metal Building 100′ x 100′ complete with insulation, electrical.

Cost $250,000

Mechanical, electrical, ventilation, plus control equipment wiring

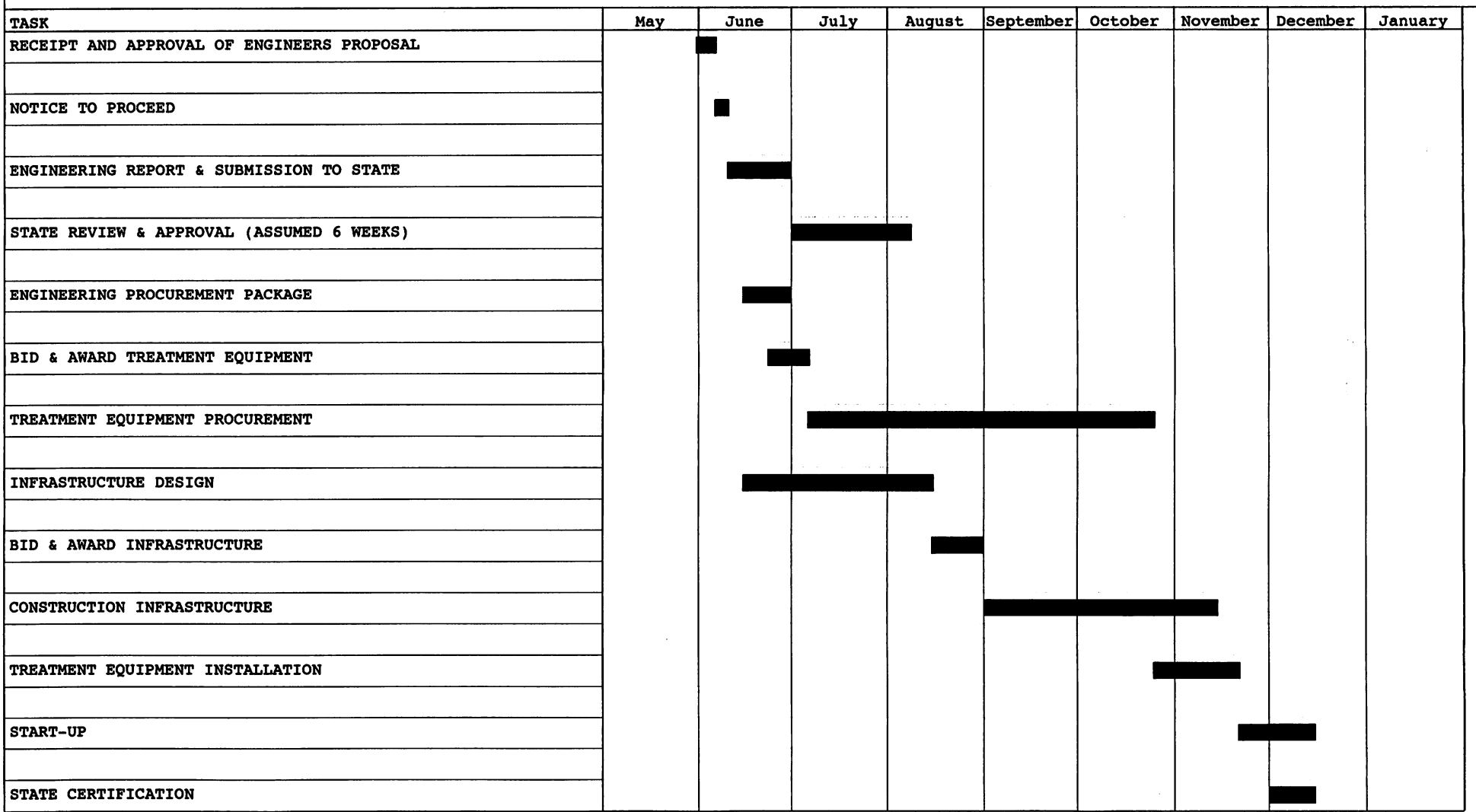
Cost $100,000

3)	Foundation:	100′ x 100′ concrete slab on grade, no drilled piers	Cost $50,000
		SUBTOTAL COST	$1,000,000
		Engineering and Contingency at 22.5%	$225,000
		TOTAL COST	$1,225,000

BIG SKY MONTANA

PACKAGE SEWAGE TREATMENT PLANT

SCHEDULE

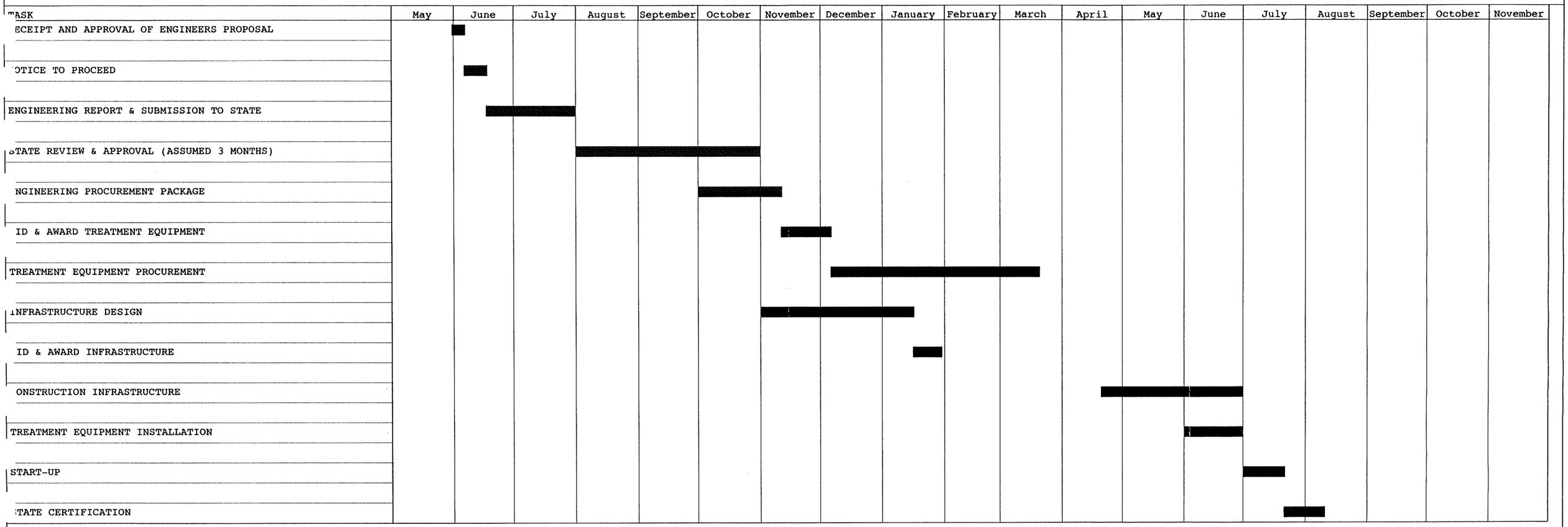


DATE: 6/7/94

BIG SKY MONTANA

PACKAGE SEWAGE TREATMENT PLANT

ALTERNATIVE SCHEDULE



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