



STATE OF MONTANA
 DEPARTMENT OF ADMINISTRATION
 INFORMATION TECHNOLOGY SERVICES DIVISION

September 10, 2004

Senator Walter McNutt, Chairman
 Environmental Quality Council
 PO Box 201704
 Helena, Montana 59620-1704

Dear Senator McNutt,

This report is an update on my July 16 letter on the water rights system. Since mid July much has been accomplished. DNRC assembled a broad committee of users and DNRC staff to build a list of system modifications and changes. The list is a consensus on the features that are needed to make the Water Rights Database fully functional by January 2005 (15 tasks), and additional enhancements (17) through the spring of 2005. This first set of modifications was labeled Phase 1, and they are the most critical required features and functions. The team also created two additional lists of changes, Phases 2 and 3, with correspondingly lesser priorities.

DNRC contracted with Northrop Grumman to obtain time and cost estimates on the Phase 1 modifications. There is every intent to get time and cost estimates on Phases 2 and 3, but the focus was on obtaining the Phase 1 estimates prior to the September 13 EQC meeting.

Northrop Grumman estimated a total of 1757.5 hours and \$161,225 to design, code, test, and implement the changes listed in Phase 1. They also proposed an additional 12% in hours and \$22,715 for project management. Northrop Grumman project management has not been included in the following table.

Northrop Grumman Estimates for Phase 1 Modifications

Delivery Schedule	Programmer analyst hours	Programmer analyst cost	System analyst hours	System analyst cost	Total hours	Total cost
November 2004	457.5	\$32,025	460	\$50,600	917.5	\$82,625
January 2005	0	0	100	\$11,000	100	\$11,000
March 2005	295	\$20,650	325	\$35,750	620	\$56,400
July 2005	50	\$3,500	70	\$7,700	120	\$11,200
	802.5	\$56,175	955	\$105,050	1757.5	\$161,225

There are several additional steps that are necessary before the system is functional prior to the start of the next session. The first step is to develop a funding plan to pay for the modifications. My assumption is that the proposed cost \$183,000 is far overshadowed by the benefits of a fully functional system that can support the DNRC, Water Court, and public. The millions of dollars of value inherent in water rights are huge compared to the cost of the proposed system improvements.

The first step is for DNRC management to develop a work plan for implementing the required changes. They will need to make a final decision on what features need to be completed by fixed dates, how will

Room 229, Mitchell Building 125 North Roberts PO Box 200113
 Helena, Montana 59620-0113



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Judy Martz
Governor

they staff the IT and program areas to fulfill their responsibilities during the modifications, and who will be the project manager. The DNRC project team started this planning work on September 9 after they received Northrop Grumman's estimates. Northrop Grumman has proposed assuming the role of project manager. Their proposed costs are in line with industry standards and they do have experience with the application, but their past management of the original contract was not adequate.

The second step is a contract for the Phase 1 work that needs to be accomplished by January 2005. Writing this contract will be far simpler than developing the Statement of Work (SOW) for the current estimates. The details on the deliverables are defined within the current SOW and Northrop Grumman's reply. The most difficult part of developing the contract will be deciding if Northrop Grumman should be awarded the contract based on its experience with the application, or dropped because of its past performance on the original contract. A decision will also be necessary on the terms of the contract: fixed price or time and materials.

The third and final step is to execute the contract and actually make the changes. The largest piece of work, 917.5 hours, will need to be done by the end of November. It will require at least 3 contractor staff to accomplish this amount of work in the time allotted. There is also a significant amount of work by DNRC program staff that will occur during these months. There will be data entry, rules definitions, and decisions that will need to be made promptly so the contractor is not delayed.

Smaller amounts of work (March 620 hours; July 120 hours) need be done from January 2005 to July 2005. Northrop Grumman did not estimate time and cost of programs necessary to report detailed water right billing information to the Department of Revenue by July 2005. This work is mandatory for billing water users if the proposed legislation is passed.

Initial System Project

The original Water Rights Database project was not completely successful by any common measure of time, scope or budget. The original Northrop Grumman proposal projected an 8 month project. The database was put into production 22 months after the project started. Northrop Grumman estimated \$206,050 in contractor costs, and the project consumed \$340,332; a 65% overrun. The latest estimate is \$183,000 to add functionality to enable decrees to be issued, a critical requirement of the original plan's scope.

These figures all indicate problems, but not the underlying source of the problems. Without a detailed review of two years of project records it is impossible to identify all the potential causes of the delays, cost increases, and missing features. It is possible the Water Rights Database project was not a top DNRC priority, and the delays were caused by lack of staff availability. The cost overruns may have been due to overly optimistic estimates by the contractor. ITSD was not asked to look into all the underlying causes of the current problems, but some information has surfaced over the past two months. This information provides a partial picture, and the basis for some of the recommendations mentioned later. These factors may have contributed to the current situation of a system that doesn't meet the user needs two years after it was placed into production.

- **Inadequate project management**

The original project was jointly managed by DNRC and Northrop Grumman project managers. Northrop Grumman's proposal listed 2% of the estimated project hours for project management. Industry averages for project management are approximately 15% of all project hours. The actual Northrop Grumman



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project management hours are unknown. DNRC assigned an internal project manager from outside DNRC's IT organization. My assumption is the DNRC project manager had no professional IT application development experience or formal project management training. Although one of the project's objectives was to limit costs and live within the current budget, the overall project cost (contractor charges, DNRC staff time, hardware, software, current Phase 1 improvement, etc.) will probably exceed \$750,000. The magnitude and critical nature of the Water Rights application called for extremely strong project management.

During the requirements definition and design phases of the original project, Jim Gilman identified dozens of features and functions that were lacking in the system design. At the time the decision was made to go into production, he still had a list of dozens of missing features and outstanding problems. The decision to move into production was probably based on a lack of time or funds for additional Northrop Grumman work. Now, two years later DNRC is faced with expensive modifications before a decree can be issued. Strong project management would have identified these issues immediately and resolved them before the new system was put into production.

- Undefined scope

The original Water Rights Database proposal from Northrop Grumman left many of the system requirements to be defined during the systems design phase. Screen designs, report layouts, conversion requirements, and other components had titles, but no specific data elements or processes identified. Without these details, Northrop Grumman's time and cost estimates were really gross guesses. It is not surprising that the project could not be completed within the original time and cost estimate in the Northrop Grumman proposal. Defining deliverables that the contractor is responsible for is a time consuming and thankless agency responsibility, but it is absolutely essential.

Many larger projects are often broken down into requirements and design stages. These initial phases are executed in a separate SOW, and no estimates are made on the development and testing phases until the initial requirement/design phase is complete.

- Original Statement of Work (SOW) terms and conditions

The SOW with Northrop Grumman specified a time and materials payment method. This approach is extremely popular for contractors and agencies. Contractors have no risk associated with making deadlines or ensuring that their time estimates are accurate. They simply agree to provide a certain set of skills and they are paid for their time regardless of what is accomplished. Agencies prefer the time and materials approach since they are not burdened with defining specific requirements. Contractors under fixed price contracts demand specific requirements to limit their risk. Critics of fixed price contracts claim that contractors inflate their estimates and costs to protect themselves against unforeseen problems. This is true. In the early 90's the largest IT service firm in the US had a 30% inflation factor for fixed price contracts. But is this any worse than paying on a time and materials basis and having the contractor not meet all the project requirements? The Water Rights Database project had an initial overrun of 65%, and the latest modifications will add an additional 89%. In all fairness, the new proposed modifications probably include features that would not have been part of an original fixed price contract. With perfect hindsight, a 30% surcharge on a fixed price contract looks like a bargain.

Room 229, Mitchell Building 125 North Roberts PO Box 200113
Helena, Montana 59620-0113

Jeff Brandt
Acting Chief Information Officer, Department of Administration

406.444.2700

Fax 406.444.2701



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Judy Marc
Governor

Recommendations

The next 4-9 months will be a critical period for the Water Rights Database system. It is essential that the system modifications be delivered prior to the start of the session, or the proposed legislation will never be enacted. The modification project must be structured to minimize every risk and maximize every chance of success. Implementing the following recommendations would be a step in the right direction.

▪ Water Rights IT Staff Assignments on the Project

DNRC may be tempted to reduce the costs of making the proposed changes by employing their own Water Rights IT staff to make several of the modifications Northrop Grumman estimated. Although Northrop Grumman only identified two technical tasks (A1-2, A1-21) where they needed assistance from DNRC technical staff, Water Rights IT staff will have many duties assisting DNRC with manual and data entry responsibilities. The DNRC Water Rights IT staff also have their regular responsibilities which cannot be ignored while the project is ongoing. The recommendation is that DNRC contract for all modifications to be performed by an outside party.

▪ Ongoing Database Support

DNRC IT support for the Water Rights Database is two IT individuals (one not hired yet) within the Water Resources Division, not the DNRC IT Bureau. This arrangement ensures that the two staff concentrate fully on the Water Rights application, but it is not the most efficient structure from a Department perspective, or the safest alternative for the Water Rights Database. There are several reasons why I recommend the support staff report to the IT Bureau within the Centralized Services Division.

- a. The DNRC IT Bureau can provide better backup support during absences due to vacations, classes, and illness of the primary technical support staff.
- b. The DNRC IT Bureau can provide decades of experience and counsel on IT operations and application development. That experience is not readily available when the Water Rights IT staff report through a separate division.
- c. The Water Resources Division does not have managers experienced in hiring, supervising, and directing IT staff.

I do not know the underlying reasons that resulted in the water rights IT support staff reporting to the Water Resources Division, but issues of control shouldn't trump superior technical support.

▪ Contract Terms and Conditions

DNRC should seriously consider fixed price contract instead of a time and materials contract. Northrop Grumman's history of estimating is not solid, and a time and materials contract could easily go beyond the initial estimates. Northrop Grumman can not object on the basis of undefined tasks since the DNRC team explicitly defined each requirement.

▪ Project Management

DNRC needs to be heavily involved in the modification process. No customer can leave all project management responsibilities in the hands of a contractor and expect a project to deliver exactly what was requested. Even if the contractor assigns an experienced project manager, the agency must have a knowledgeable representative, either DNRC staff or an independent individual, looking out for the agency's interests. Unfortunately, the usual situation is that agency managers do not have the time or IT project management experience. Jim Gilman, Kim Overcast, and Terri McLaughlin are probably

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excellent examples of this dilemma. Jack Zanto, DNRC IT Bureau Chief, is a possibility provided he has the time and project management experience.

The project must also have a clear definition of roles and responsibilities. These definitions are often part of the project charter or SOWs with contractors. Since dozens of small and large decisions will be made throughout the months of modifications, authority must be vested in the project manager or Water Rights Program Managers, not the contractor or technical staff.

- New User Guide and User Training

The system user guide was originally developed 2 years ago, and it has not seen a major update since that time. The changes proposed in Phase 1 will make the old user guide even more inaccurate. Prior to the rollout of the modified system, DNRC will need to train the existing users on the modified system and also provide them with a new user guide as a reference. This step can significantly ease the migration pain.

- Operational Review

Prior to January the system would benefit from having a thorough review of system administration procedures and operations. There has been conflicting information on the existence and use of a test database and offsite tape storage. With the additional of many new users, a usage fee, and accelerated court activity, the system will come under much more pressure. Availability and reliability of the system will be critical. Now is the time to ensure that the safest, most secure, and most reliable procedures are being used. Oracle and Windows systems administrators and database analysts from ITSD or another large agency could perform the review at little or no cost.

I have watched the DNRC project team work for several weeks, and they have the skills and drive to make the water rights system work. If the funding can be arranged, and the project structured correctly, this team can deliver. Please contact me if you have any additional questions.

Sincerely,

Kyle Hilmer
Bureau Chief, Policy and Planning Services

cc. Jeff Brandt, Krista Evans, Terri McLaughlin, Jim Gilman, Kim Overcast