MANAGING DECOMMISSIONING PROJECTS
USING *D&D TRAK*

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ABSTRACT

Numerous buildings throughout the DOE complex are being decommissioned. The decommissioning process typically includes dismantling equipment and utility systems for disposal, decontaminating remaining surfaces to meet regulatory limits, demolishing the building structure, and remediating the surrounding environment to address any historical releases. Typically, a large amount of information and radiation survey data needs to be processed and evaluated. Rapid assessment of project information is required to effectively manage unanticipated conditions that are frequently encountered as building components are dismantled. Parsons has developed a relational database called *D&D TRAK* to estimate, plan, manage, and track decommissioning projects. *D&D TRAK* has been successfully used at DOE and other federal facilities to terminate radioactive licenses thus allowing the unrestricted free-release of these buildings to public and private sectors.

INTRODUCTION

D&D TRAK was originally developed in 1997 to manage and evaluate the large quantities of radiological survey data collected to terminate Nuclear Regulatory Commission (NRC) licenses per requirements published in the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM). Over the years, *D&D TRAK* has evolved into a comprehensive planning, estimating, and management tool to minimize overall project risk and associated contingencies, and to provide data management and evaluation.

HOW IT WORKS

D&D TRAK is a user-friendly, menu-driven relational database that was developed using Microsoft Access®. The database supports simultaneous multiple users and contains the following modules.

- A planning module to record building construction information, quantities, and other characteristics on a room-by-room basis. This module also allows individual work tasks to be identified on a component basis.

- An estimating module to develop detailed estimates of labor hours, waste volumes, and project costs.

- A scheduling module to organize labor hour estimates by the project Work Breakdown Structure (WBS) and directly interface with a standard scheduling software package for developing a resource-loaded project schedule.

- A waste module to aid in the management, certification, scheduling, and tracking of waste shipments.

- A characterization module for planning and compiling survey results to demonstrate that unrestricted use criteria have been achieved based on the statistical approaches presented in MARSSIM.

- A status module to track actual progress against the project baseline, confirm or adjust budget estimates, and update project forecasts.

The relationships between the various modules are shown in Figure 1. *D&D TRAK* provides planning information that is initially based on estimates, which are tracked and updated throughout the project with actual performance data. The variance between the initial estimates and actual performance is used to assess the impacts on project schedule and budget, update forecasts at project completion, and identify problem areas where corrective action needs to be invoked. The early identification of problem areas reduces project risk and helps ensure that the project will be completed on schedule and within budget.

The structure of each module was developed to provide flexibly and to allow the user to customize the database fields and reports to fit individual project needs. Further details regarding the structure, use, and output of each module are provided in the following sections.

Planning Module

The key to developing high-quality planning documents for decommissioning projects is to properly scope and quantify the tasks to be performed. The planning module is the heart of *D&D TRAK* and provides a bottoms-up approach to develop detailed estimates and plan decommissioning tasks. A key feature of *D&D TRAK* is to subdivide the decommissioning project into management units. Each management unit represents a contiguous area, such as a basement or a series of rooms with similar characteristics that can be isolated and decommissioned separately. By dividing large buildings with a multitude of rooms into a smaller number of management units, the complexity of the project is reduced. Room location, contaminant levels, previous usage, wall construction, ventilation zone, and other features are considered when delineating management units.

The planning module consists of a series of menu-driven entry forms that are used to record information on a management unit of room basis. Figure 2 (Planning Module Data Entry Form) provides an example of the available data fields. The type of information that can be recorded includes:

- Location information such as building, floor, room, and management unit,
- Survey unit designation to subdivide the building into areas for evaluating the final status survey results.
- Physical dimensions including area and height,
- Usage information such as office, laboratory, and production area,
- Other pertinent engineering data such as utility service zones,
- Quantity information to record the content and construction of each room, and
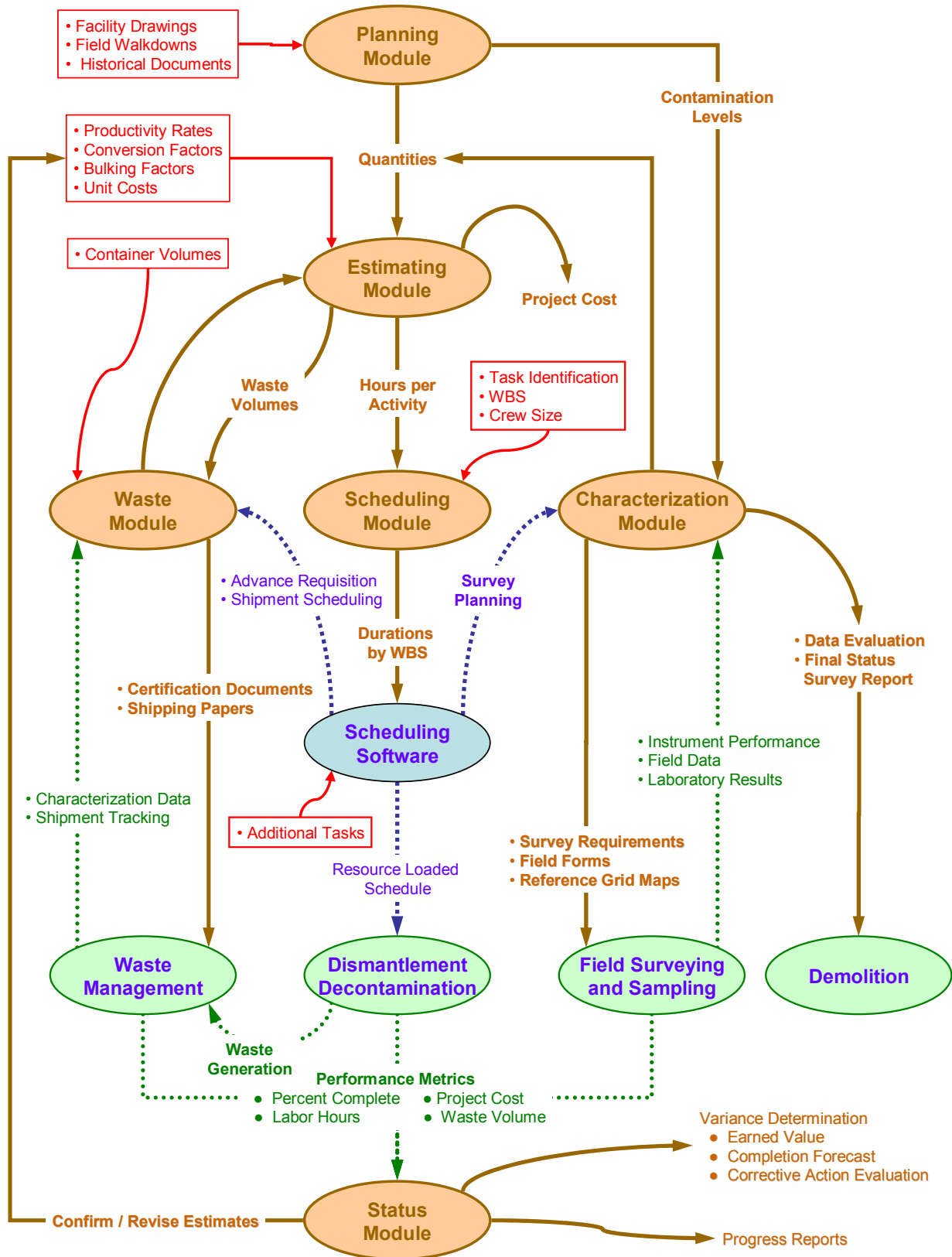- Room characterization information (Not shown in Figure 2).

Fig. 1. Relationship between *D&D TRAK* modules and decommissioning process.

Fig. 2. Example D&D TRAK planning module data entry forms.

The Component Construction Entry Form is designed to record data for a wide range of components including walls, floors, ceilings, equipment, piping, lighting, and conduit. Standardized categories and descriptions are used to allow the quantity information to be appropriately tallied and sorted. However, the user has the ability to expand the standardized list to accommodate building-specific features and components. The characterization input table is designed to record the type and level contamination expected to be encountered based on historical releases and previous monitoring data. The user can also customize the pre-loaded list to incorporate project-specific parameters. The contamination levels are used in conjunction with information from *D&D TRAK's* other modules to identify areas requiring decontamination, classify waste streams, and adjust productivity rates to account for health and safety precautions.

The construction and quantity information is initially collected during the project planning stage from engineering drawings, reports, and building walkdowns. The planning module information can be further revised and refined throughout the project as additional data becomes available.

Parsons is planning to enhance the capabilities of the *D&D TRAK* by adding direct electronic entry of walkdown information into the planning module via an interface with a personal digital assistant (PDA) that can be taken in the field.

Estimating Module

After the planning module information has been compiled, various algorithms within *D&D TRAK*'s estimating module are used to develop labor hour, waste volume, and project cost estimates. The estimates are based on productivity rates, conversion/bulking factors, and unit costs that are applied to the quantity information assembled in the planning module. The various rates and factors were compiled from DOE documents, industrial metrics [such as *Dodge Unit Cost Guide* (1) or Means (2, 3)], and physical properties for standard materials of construction. These rates and factors are pre-loaded into look-up tables that are included in the estimating module. The pre-loaded values cover a range of decontamination, dismantlement, and demolition methods for a variety of building components. The look-up table can be customized to incorporate project-specific methods and values. Adjustment factors are also included to account for health and safety, security, or other requirements that tend to lower productivity.

The estimating module allows the estimates to be summarized by component and/or management unit. Table I provides an example output for a labor hour estimate. This estimate can be used to develop scopes of work for various subcontractors and allows the resulting bids to be assessed. For example, all of the asbestos abatement activities could be separated for inclusion in a single bid package. This division of the decommissioning project from a single database allows the development of multiple subcontractor bid packages that have consistent interfaces and avoid duplicative items. The waste volume estimate is further segregated by waste type (such as asbestos, low-level, hazardous, and mixed waste) based on the expected type and level of contamination identified in the planning module. Table II provides an example output for the waste estimate. Separate waste management and disposal unit costs are applied to each waste type to determine the overall project cost.

Table I. Example D*&D TRAK* labor hour estimate output.

Management Unit	General Dismantlement	Mechnical Dismantlement	Electrical Dismantlement	Decontamination	Demolition	Totals
A	200	80	120	80	80	**560**
B	860	520	420	860	60	**2,720**
C	750	120	80	180	60	**1,190**
D	1,240	860	560	340	140	**3,140**
E	100	20	220	160	50	**550**
F	0	0	0	0	120	**120**
G	280	150	70	160	60	**720**
H	350	230	110	220	30	**940**
I	180	500	50	0	20	**750**
Total	**3,960**	**2,480**	**1,630**	**2,000**	**620**	**10,690**

Table II. Example D&D TRAK waste estimate output.

Component Category	Waste Type					
	RCRA (cy)	Low Level (cy)	Mixed Low Level/RCRA (cy)	Solid (cy)	Recycled Concrete (cy)	Totals (cy)
Walls	0	750	10	860	10,610	**12,230**
Floor	0	110	90	260	8,580	**9,040**
Ceiling	0	100	0	380	0	**480**
Light Fixtures	0	270	0	670	0	**940**
Pipe	40	100	20	90	0	**250**
Conduit	0	330	0	520	0	**850**
Equipment	10	740	360	1,860	0	**2,970**
Hoods	0	0	360	0	0	**360**
HVAC Duct	0	210	0	260	0	**470**
Total	**50**	**2,610**	**840**	**4,900**	**19,190**	**27,590**

Component Category	RCRA (# of Units)	Low Level (# of Units)	Mixed Low Level/RCRA (# of Units)	Solid (# of Units)	Recycled Concrete (# of Units)	Totals (# of Units)
Fluorescent Tubes	6,490	0	4,360	0	0	**10,850**
Ballast	1,630	0	1,090	0	0	**2,720**

The accuracy and breakdown of the estimate is dictated by the user based on the level of detail recorded in the planning module. For example, data can be identified on a room, floor, or management unit basis depending on the variability of contamination, effective division of the building into management units, and other building characteristics. Recording information on a room-by-room basis provides the most flexibility resulting in a more accurate estimate. However, this approach requires the greatest amount of time to input the information into the database. The user can also expand the number of building components and material types to increase the accuracy of the estimates. For example, users may want to distinguish between different wall types to assign lower productivity factors for demolishing highly reinforced concrete vaults versus removal partitions.

The bottoms-up approach used in D&D TRAK allows more refined and precise estimates to be developed than straight benchmarking. The higher level of accuracy achieved by D&D TRAK reduces project risks and associated contingencies. The database also allows the quantity estimates to be easily segregated by component, waste type, subcontractor, room type, and management unit to provide comprehensive planning information.

Scheduling Module

The scheduling module provides a direct interface between *D&D TRAK* and standard scheduling software packages (such as Microsoft Project® or SureTrak® Project Manager) to generate a resource loaded schedule. A uniformed work breakdown structure (WBS) is assigned through *D&D TRAK* by management unit, building component, and activity. The uniform WBS allows actual productivity and cost information to be compared against the *D&D TRAK* benchmarks and subsequent decommissioning projects.

The sequencing of the WBS is established within the scheduling software. The duration of each individual activity is calculated based on the labor hour estimates developed in *D&*D TRAK's estimating module and a work crew size allocation table developed in scheduling software. The appropriateness of the resource loading is verified through the scheduling software to amend the task sequencing, level-out available resources, or adjust the number of work crews provided for each activity. The duration of activities not covered by *D&D* TRAK can be manually identified in the scheduling software based on previous project experience.

By linking *D&D TRAK* to a resource loaded schedule, weekly or monthly look-ahead task assignments can be easily generated to effectively assign work crews to upcoming tasks. The linkage also provides a mechanism to identify and assess changes in project conditions associated with health and safety, applying different decommissioning methods, and other factors that impact worker productivity.

Waste Module

Information from the estimating and scheduling modules is used in conjunction with the waste module to develop time-based waste generation projections for advance requisitioning of waste containers and scheduling waste shipments. The waste module is also designed to manage waste characterization data and track waste shipments. This module includes an interface form to input inventory of the waste container, analytical results, and other information that is required to certify each waste shipment. Information from other modules is linked to the waste module by the location where the waste was generated. This provides a cradle-to-grave paper trail that includes room characteristics from the planning module and in-progress survey results from the characterization module. Manifests, DOT shipping papers, and waste facility acceptance forms are generated when all the certification information is obtained. This module is also used to ensure that the waste shipments arrive at their designated destination.

Characterization Module

The characterization module aids in defining the survey requirements and provides a convenient platform for compiling, validating, evaluating, and documenting survey results per MARSSIM requirements. The module output can be processed and evaluated in the field on a real-time basis to specify worker safety and contaminant controls, verify completion of decontamination, and allow redirection of field survey efforts. These real-time capabilities save on costly remobilization of field crews and equipment. The main features of the characterization module include:

- **Survey Planning** - The characterization module integrates room information previously compiled in the planning module to identify survey units and determine the number of measurements required to meet the size restrictions and criteria set forth in MARSSIM. Field forms that summarize the survey requirements for each survey unit are generated from this module. The field forms, coupled with CAD or GIS generated grid maps, provide a powerful planning tool to direct and coordinate field surveying.

- **Instrument Performance Tracking** – Field instrument performance is monitored by comparing daily source and background check readings against an initial set of control readings. If the daily check reading falls outside the established quality control limits, *D&D TRAK* provides a warning message. Trend graphs are also generated to assess instrument drift. The calibration efficiencies and background readings recorded in the characterization module are used to calculate the minimum detectable activity (MDA) for each field instrument based on MARSSIM protocols.

- **Data Compilation** - The characterization module can accommodate virtually unlimited amounts of field measurements and analytical results. Data from field instrument loggers and electronic laboratory results can be downloaded directly into the characterization module, which saves time and eliminates data entry errors. The module converts gross field instrument counts to net radionuclide-specific activities based on the instrument efficiencies and background readings for any given location, date, and instrument used.

- **Data Evaluation** - The characterization module has extensive data manipulation and evaluation capabilities to demonstrate that the final status survey complies with the criteria specified in MARSSIM to allow unrestricted release. Criteria are established within this module to validate or flag data that require further investigation. Data can be sorted and evaluated by measurement type, survey unit, construction material, surface type, or any other used-defined query. Evaluation results can be printed in a variety of standard formats (tables and graphs) for direct inclusion in the Final Status Report, thus saving time and money.

Status Module

The success of completing a decommissioning project on schedule and budget resides in the ability to accurately determine intermediate progress and develop reliable forecasts to complete remaining tasks. Weekly percent complete, waste volume generated, labor hours, project costs, and other performance metrics are tracked and compared to the planned values developed with the estimating module. If the variance between the actual and planned schedule or budget performance exceeds pre-set limits, *D&D TRAK* provides a warning message so that the project manager can initiate early corrective actions when required.

Various factors contained in the planning and estimating module can be adjusted based on actual project-specific performance data to adjust individual task durations. For example, if the generated waste volumes are significantly different than the compiled estimates, the conversion and bulking factors contained in the estimating module can be adjusted to improve the accuracy of future projections.

The linkage between *D&D TRAK* and the scheduling software package provides a powerful tool to rapidly update the project schedule and to develop revised forecasts at project completion. For example, should unplanned activities or schedule delays be encountered, the status module can be used to assess the predicted benefits and impacts of different corrective actions options, such as reassignment of available resources or purchase of additional equipment.

The status module can also be adapted to generate progress reports and other information to control and track the decommissioning project. The benefit in reporting this information from a central location is improved planning, tracking, forecasting, and control of the decommissioning project.

CONCLUSIONS

D&D TRAK provides the information needed to effectively plan, accurately estimate, and safely execute decommissioning projects. Its real-time scheduling and status capabilities allows the project manager to track project performance as it occurs and to quickly react to changing conditions thus minimizing impacts to project schedule and budget. In short, *D&D TRAK* has contributed to the successful completion of several decommissioning projects by providing a powerful management tool to reduce project risks and associated contingencies.

REFERENCES

1.   *Dodge Unit Cost Guide,* Marshall & Swift, McGraw-Hill.

2.   *Building Construction Cost Data*, RSMeans Company, Inc.

3.   *Environmental Remediation Cost Data Unit Price*, RSMeans Company, Inc.