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SAP PRESS E-Bites

Introducing Environment, Health, and Safety (EHS) Management with SAP S/4HANA®

Michael Censurato

Rheinwerk Publishing

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What You'll Learn

This E-Bite introduces solutions for managing the health and safety of your employees and equipment in SAP S/4HANA. First, you'll start with the basics of environment, health, and safety (EHS). Then you'll walk through processes for incident management, environment management, management of change, and maintenance safety. Next, you'll explore how EHS solutions get deployed with SAP S/4HANA. Finally, look ahead to see the future possibilities for SAP's EHS solutions.

1 Environment, Health, and Safety Basics

Welcome to what we hope will be an informative read on the software applications that make up SAP's environment, health, and safety solution set. The objective of this E-Bite is to first introduce the environment, health, and safety (EHS) domain and business function, giving context to the functional overview of SAP's EHS solutions, which are the main focus. There are also sections on basic deployment considerations and the future vision of where the solutions are headed.

The intended audiences for this material are EHS practitioners who are trying to understand what SAP's EHS solutions could do for their business processes; existing users of SAP's EHS solutions who need a broader view of the platform; functional consultants who have never worked with these applications before; and managers or executives who are evaluating IT and business strategies to foster operational excellence, sustainable operations, and a stronger safety culture. This is not written to be a consulting or technical manual, but instead to be more of a primer for business and functional stakeholders.

In this section, we'll begin by discussing the value proposition of EHS software applications in general, and then focus specifically on the evolution, scope, and value of SAP EHS solutions.

1.1 Why Use Environment, Health, and Safety Software?

Every organization, public or private, big or small, will set a business strategy and then conduct operations to execute on that strategy. In doing so, risk is created and must be managed. How that risk manifests itself is dependent on the type of enterprise. What does not vary is the positive impact management systems and the software solutions that support them can have on risk mitigation.

An example scenario frequently used to illustrate this is that of an employee suffering a significant workplace injury. Naturally, a company immediately thinks about the well-being of the employee, but such an event can also create major financial, compliance, productivity, and brand issues for the company. Worldwide, the latest statistics show that roughly 340 million workplace accidents occur on average, according to the International Labor Organization, costing companies almost $3 trillion dollars, according to *Safety+Health* magazine. In this case, an operational and safety risk becomes a business risk.

Note

Visit the International Labor Organization website at http://s-prs.co/v553601 and the *Safety+Health* magazine website at http://s-prs.co/v553602 for more details on these statistics.

The EHS business function (along with related processes in human resources, asset management, etc.) is key because it has evolved from a focus on ensuring regulatory compliance to a focus that drives business continuity, brand preservation, and possibly competitive advantage through cost reduction, productivity, and improved employee retention. Hence, you want to support this function with the right tools and systems to be effective. You want to use systems to promote a proactive safety culture along with compliant and sustainable operations.

In the following sections, we'll outline some of the key benefits of using EHS software, including establishing better transparency and control of business operations, reducing operational and compliance risks, and having the opportunity for better data and more insight into that data.

Transparency and Control of Business Operations

Digitizing the operational EHS processes by using modern transactional and analytical applications can make those processes more transparent. Forcing transparency and adhering to strong management systems have knock-on benefits to the organization.

These include a higher level of readiness for ever-increasing disclosure requirements, legal situations, and corporate governance initiatives. Transparency is fast becoming part of the cost of doing business and a basic expectation from all stakeholders in an enterprise. An auditable system with structured data and robust analytical options helps foster that transparency. This is true for EHS processes as well as any other.

Achieving a desired level of operational control is made easier when business processes, institutional knowledge, company policy, and best practices are at least partially reflected and supported by software applications. Managing transactions and communication with proactive workflows and notifications help prevent work items and issues from "falling through the cracks" and never being resolved. This is especially important when trying to ensure regulatory compliance, ensure a safe workplace, prevent catastrophic incidents, and promote sustainable operations. Restricting access to data based on the role someone has within a process is a form of operational control even if you consider it just an IT function. There are new rules to ensure data privacy and protect personal information, correctly manage health-related data, and monitor cybersecurity concerns, which all need to be balanced against providing workers with the information and capabilities they need to do their job. Software systems can better enable communication and collaboration between disconnected stakeholders. EHS-related processes, like tracking incidents, assessing risks, and compliance assurance, end up involving workers in the field to corporate executives; it's imperative that information is flowing at all levels.

Finally, for those companies that have enhanced their sustainability and social responsibility focus and have implemented policies to improve performance, software systems can help collect data in a consistent and validated way to increase confidence in what is being reported.

Reduced Operational and Compliance Risks

We mentioned earlier that implementing an EHS software system or platform will have a positive impact on your efforts to mitigate risk within an enterprise.

Mitigating operational risk requires involvement of more than just the EHS function, and is one, if not the primary, objective of EHS management systems and EHS software systems. Managing through the lens of risk allows smarter decisions on how to prevent incidents, reduce injuries, protect the environment, and ensure compliance. Operational risk comes in many forms and it is imperative to build out a strategy to manage it. Software can help encode and drive that strategy. Without a doubt, risk management can be done without software systems and has been for a long time.

However, risk management systems are put in place to improve situational awareness across the enterprise, which helps organizations to quickly and accurately identify risks so that whatever controls that are set up are timely and more effective. Figure 1.1 depicts the basic Plan-Do-Check-Act (PDCA) cycle that underpins many safety and risk management efforts.

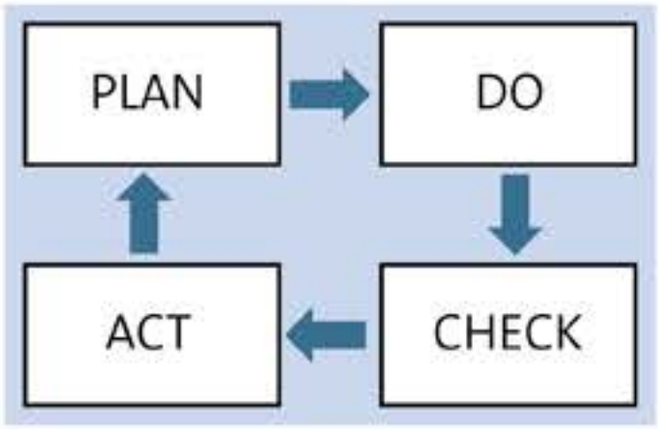


Figure 1.1 The Plan-Do-Act-Check Cycle

Besides the internal factors that can create compliance risk externally, a matrix of partially harmonized regulations at global, regional, and local levels impact the EHS business function and increase complexity. An electronic repository of all compliance requirements tracked down to the local level, or even further to specific equipment and production areas, is key in mitigating this risk. Applicability is known, the scope of the requirement is documented, and tasks can be assigned and executed to ensure compliance. If such an application is effective, not only will compliance risk be reduced, but the cost of ensuring compliance will also; there will be consistent workflows, quicker reactions to deviations, reduced penalties and fines, and fewer resources to track all requirements and to ensure the organization is doing all that is needed to meet those requirements.

Better Data and Insight for IT Management

Probably the most easily identifiable and measurable benefit of using software applications to drive EHS processes is the improvement in data quality and data access. This is apparent, from the transactional data entry steps, to end users, to "power users" who are responsible for end-to-end processes, and to the entire audience of corporate analytics. Data quality is improved when software is enabling and validating the collection of information from end users. Using incident management again as an example, a user entering information on the incident location, the people involved, the time of the event, etc. will have a better user experience and provide better data if the software is applying validation and formatting rules to what is being entered. A truly integrated application like SAP EHS Management, incident management can also allow the user to refer to valid person records, valid locations

and equipment records, and data entry in their native language, all resulting in fewer errors and more complete data.

Role-based access to the system was listed as an operational control earlier in this section and as a mechanism to improve data quality. However, when someone is using these applications, they're ensuring that they're only seeing or entering data required by their role; this will improve auditability and user experience.

Finally, the whole point of ensuring data quality for data entry and processing is to obtain useful and actionable insights from the system. Running applications that are integrated allows you to gain insight from the rest of the enterprise to make better decisions on corrective actions, investments in safety equipment, communicate costs, and ensure situational awareness at all levels. This is something encouraged by the ISO 45001 standard on occupational health and safety. The data being collected can be used at the transactional level, used for predictive modeling, and paired with big data sets for additional insight. Finally, software can drive reporting that is automatically scheduled and distributed and streamline communication efforts, even to external stakeholders.

1.2 The Evolution of Environment, Health, and Safety with SAP

SAP has offered a scope of functionalities for EHS within its platform since the late 1990s. The initial focus was on chemical management and product stewardship, while the operational topics like safety, waste management, and industrial hygiene came later. The EH&S add-on in SAP R/3 (which you may see referred to as "EH&S classic") was eventually replaced by the SAP EHS Management component extension as the primary option within SAP ERP. More recently, SAP EHS was developed within the digital core of SAP S/4HANA Enterprise Management and is available for both cloud and on-premise deployments. We'll discuss this evolution, along with the current SAP EHS Management portfolio, in the following sections.

The Previous Version: Environment, Health, and Safety within SAP Business Suite

In 2010, SAP developed the SAP EHS Management (EHSM) component extension, positioned as a total revamp of the "classic" EH&S add-on first built in SAP R/3. From a technical and commercial aspect, it was released as a separate product requiring a new license purchase. The EHSM component extension was simply an extension to the SAP ERP platform with additional required activation steps.

Functionally, the EHSM component extension added new processes with each successive release. Incident management was first developed in version 1.0, risk assessment in version 2.0, up through version 6.0, where compliance management and emission calculations first appeared to supersede the Java-based (and now retired) SAP Environmental Compliance product. The product compliance functionality was included in the EHSM component extension, similar to how it was offered in the SAP EH&S add-on. This would eventually change in SAP S/4HANA. Technically, the screens were mainly developed in Web Dynpro for ABAP, the application architecture built in SAP Netweaver with Business Object Processing Framework (BOPF) and Floorplan Manager. Instead of leveraging the Windows Word Processor Integration (WWI) form tool from EH&S, it was decided to use SAP Forms service by Adobe and SAP Adobe Interactive Forms for both data entry options and formatted outputs, like regulatory submittals. Analytical reporting was provided by extracting data to SAP Business Warehouse and using the BEx Analyzer tools. The EHSM component extension version 6.0 would be the basis of what was migrated to the new SAP S/4HANA platform (see Figure 1.2).

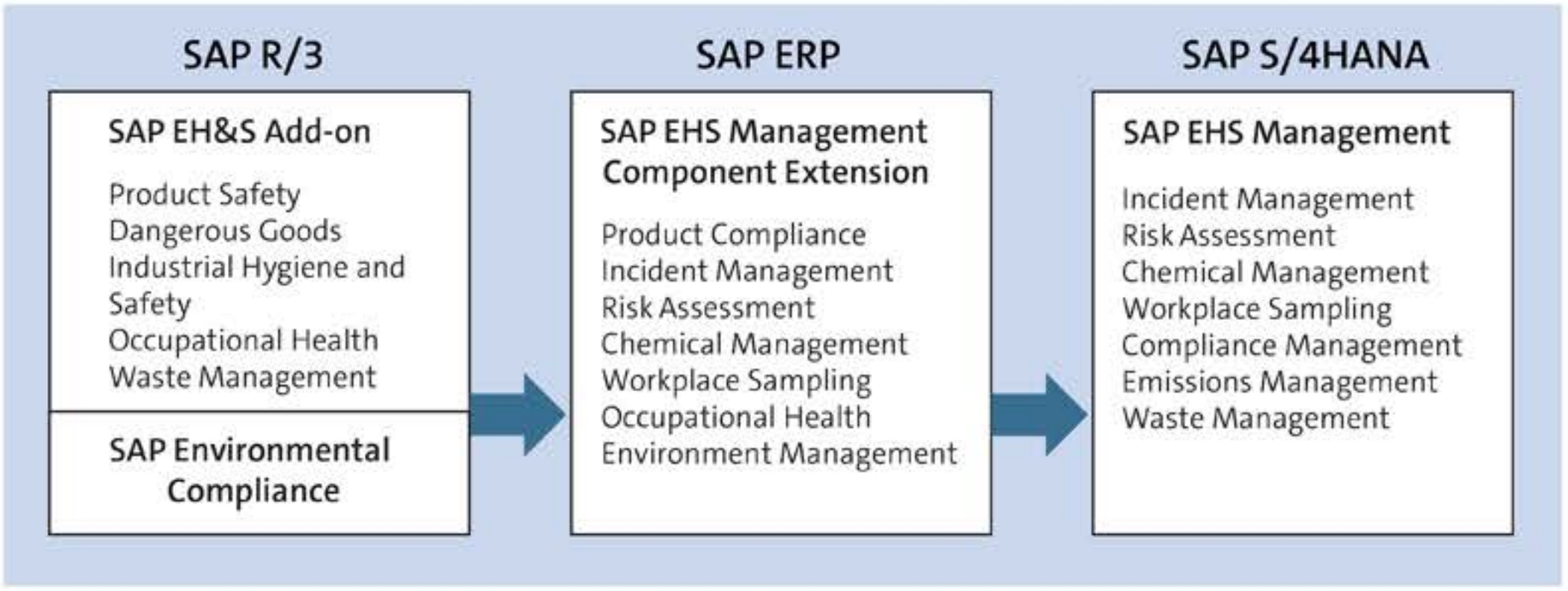


Figure 1.2 Basic Evolution of SAP EHS Functionality

What's New: Environment, Health, and Safety within SAP S/4HANA

In 2015, with the new SAP S/4HANA enterprise management platform starting to take shape, it was decided that the SAP EHS solutions would be part of the first wave of business applications migrated to this new platform. The 1610 version (released October 2016) of the on-premise SAP S/4HANA included SAP EHS Management, incident management and parts of SAP EHS Management, health and safety management. By the 1809 release in 2018, the three SAP EHS applications plus the partner-developed SAP Work Clearance Management application were ported over. SAP Management of Change was moved in the 1909 release of SAP S/4HANA.

Note

Starting in 2018, SAP began work to offer EHS functionality in both hosted single-tenant cloud deployments, and multi-tenant public cloud deployments of SAP S/4HANA. As of the publication date of this E-Bite, all of the functionality is available in a single-tenant offering, and all but one application is available for multi-tenant deployment.

In SAP S/4HANA, SAP EHS Management leverages various technical improvements along with additional functionality. Some of these are part of the application architecture, but many are features of the SAP S/4HANA platform that the users of SAP EHS Management can take advantage of. First and foremost, the entire user experience is now based on the SAP Fiori user experience (UX) standards, which offers a tile-based, role-based launchpad to access SAP functions, instead of transaction codes. Most of these tiles are "live" and have dynamic data showing right in the launchpad. A good example is the Incident Rate app, which shows the result of a real-time incident rate calculation each time you log in to the system. Tiles can open transactional and data entry screens, analytical views, and specialized apps like My Inbox, which will show a user all of the inbound workflows and notifications coming to them. Within the SAP EHS applications, you'll see that some screens still have the structure of a Web Dynpro application based in the older SAP ERP platform, but an SAP Fiori "skin" to match newer screens—these are holdovers from the migration of functionality from that older platform to SAP S/4HANA. Over time, all of this functionality is planned to be replaced with native SAP Fiori UX. SAP EHS Management adheres to the latest SAP Fiori 2.0 standards. See Figure 1.3 for an example of a SAP Fiori launchpad for a user accessing SAP EHS Management, incident management.

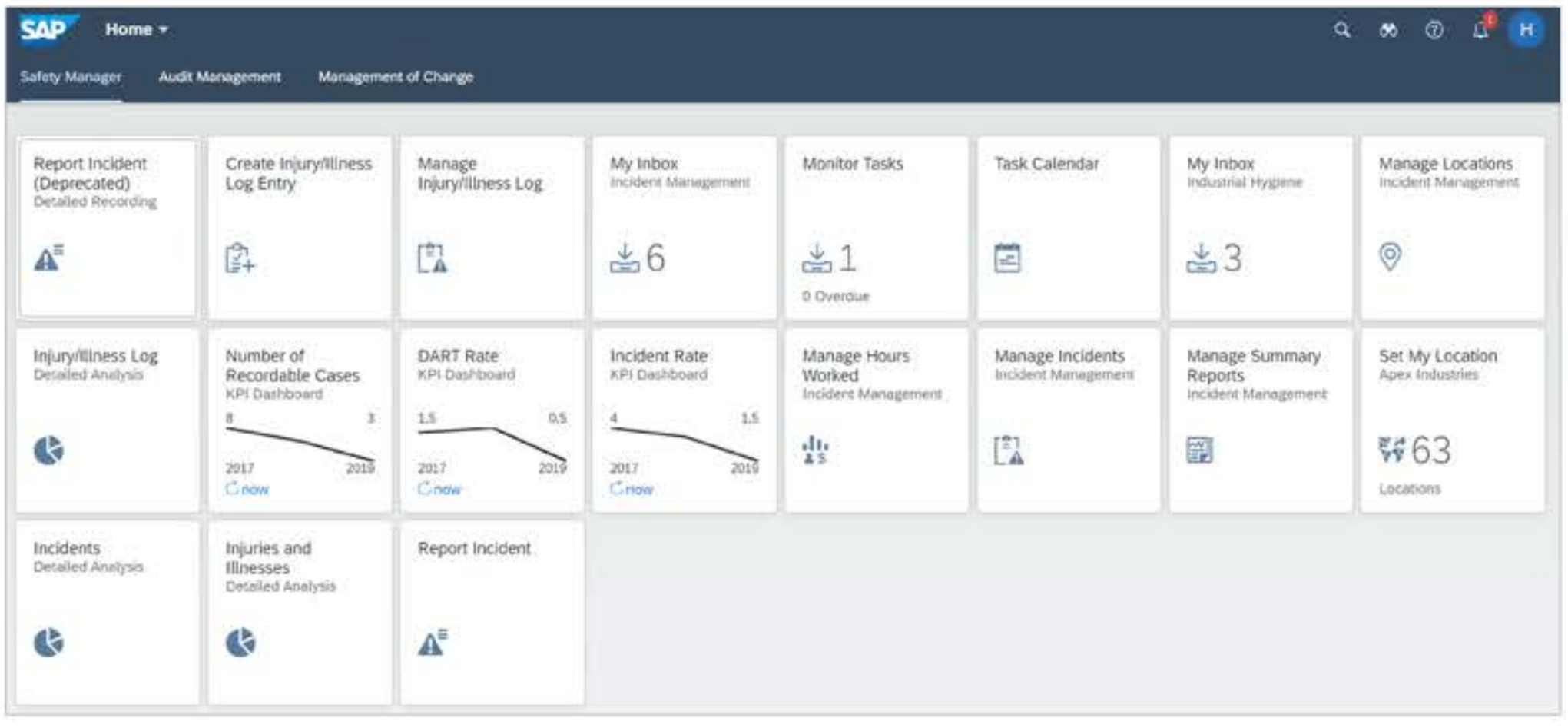


Figure 1.3 Typical SAP Fiori Launchpad for Users of SAP EHS Management, Incident Management

SAP Fiori also enables a device-agnostic UX approach, and, besides allowing access to all SAP EHS Management screens on a mobile device, there are dedicated mobile applications for specific steps in the process where it's highly likely that access to the SAP system is required or value-added. For example, workers on the shop floor can use a mobile app to record incidents or unsafe conditions in situ, or operations teams doing inspections or compliance checks can input data in the field. Figure 1.4 shows a mobile-first app for identifying hazards while out in the field or on the shop floor.

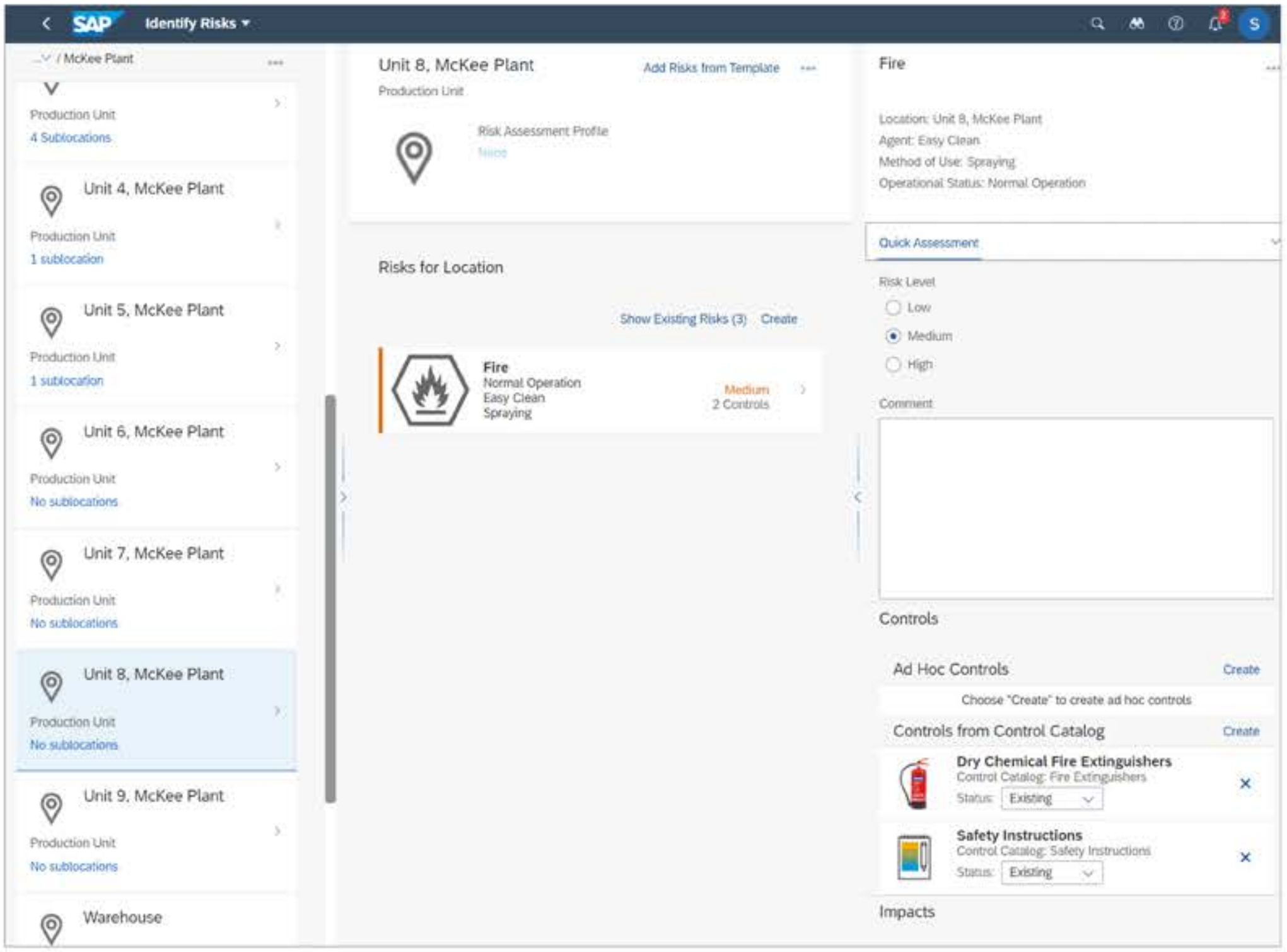


Figure 1.4 Identify Risks App in SAP EHS Management

The task management functionality that is specific to SAP EHS Management was revamped in SAP S/4HANA and offers a much different process for creating tasks and processing them, compared to what was built in SAP ERP. There is a guided process for creating tasks in a native SAP Fiori application; utilizing the My Inbox app for users to see what they are assigned to without having to open any SAP EHS Management screens; task monitoring apps and reports; and the Task Calendar app, which will track tasks from all of the SAP EHS Management applications in one view. The process is still driven by the SAP Workflow engine to provide commonality with

other SAP applications, and maintenance notifications can be triggered in SAP Plant Maintenance from tasks in SAP EHS Management .

A very significant improvement compared to what is available in the EHSM component extension in SAP ERP is around the reporting and analytics options for the SAP EHS Management users. It should be noted that applications on the SAP S/4HANA platform leverage the SAP S/4HANA in-memory database and related architecture, which enables essentially real-time reporting within the application. That is a new option and much different experience from SAP Business Warehouse and the business intelligence and business object tools available in SAP ERP. With the exception of SAP Work Clearance Management, all of the SAP EHS Management applications leverage this feature in apps categorized as *embedded analytics*. Objects called *core data services views (CDS)* pull transactional data and make all available to the reporting functions. Besides tabular search and data explorer apps, the primary tool used by SAP EHS Management for ad hoc reporting and analytical outputs is called *Analysis Path Framework (APF)* (see Figure 1.5).

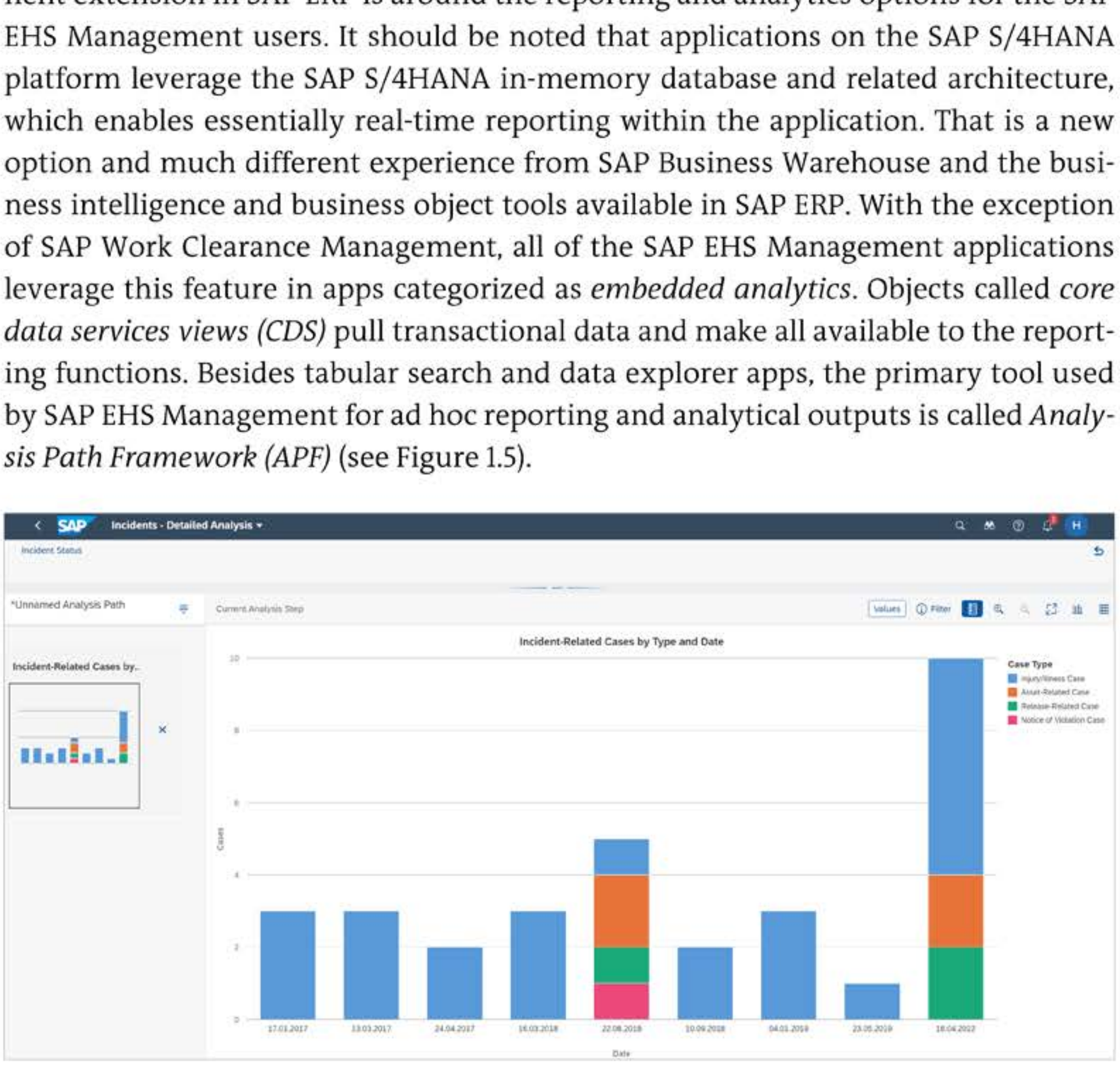


Figure 1.5 First Step in a Drilldown with the Analysis Path Framework Tool

The APF allows us as the user to select an overarching analytical topic like **Incidents by Month** and then create an analytical drill-down path through more details to arrive at the chart or view that you want. The report can then be saved as a PDF, or the data can be extracted for further processing if needed. This is possible in real time, where the user doesn't have to export data to a data warehouse or other tools before setting filters and charting options.

Current SAP EHS Management Solution Portfolio

As of the publication date of this E-Bite, the SAP EHS Management portfolio of solutions has recently expanded to include waste management (see Figure 1.6).

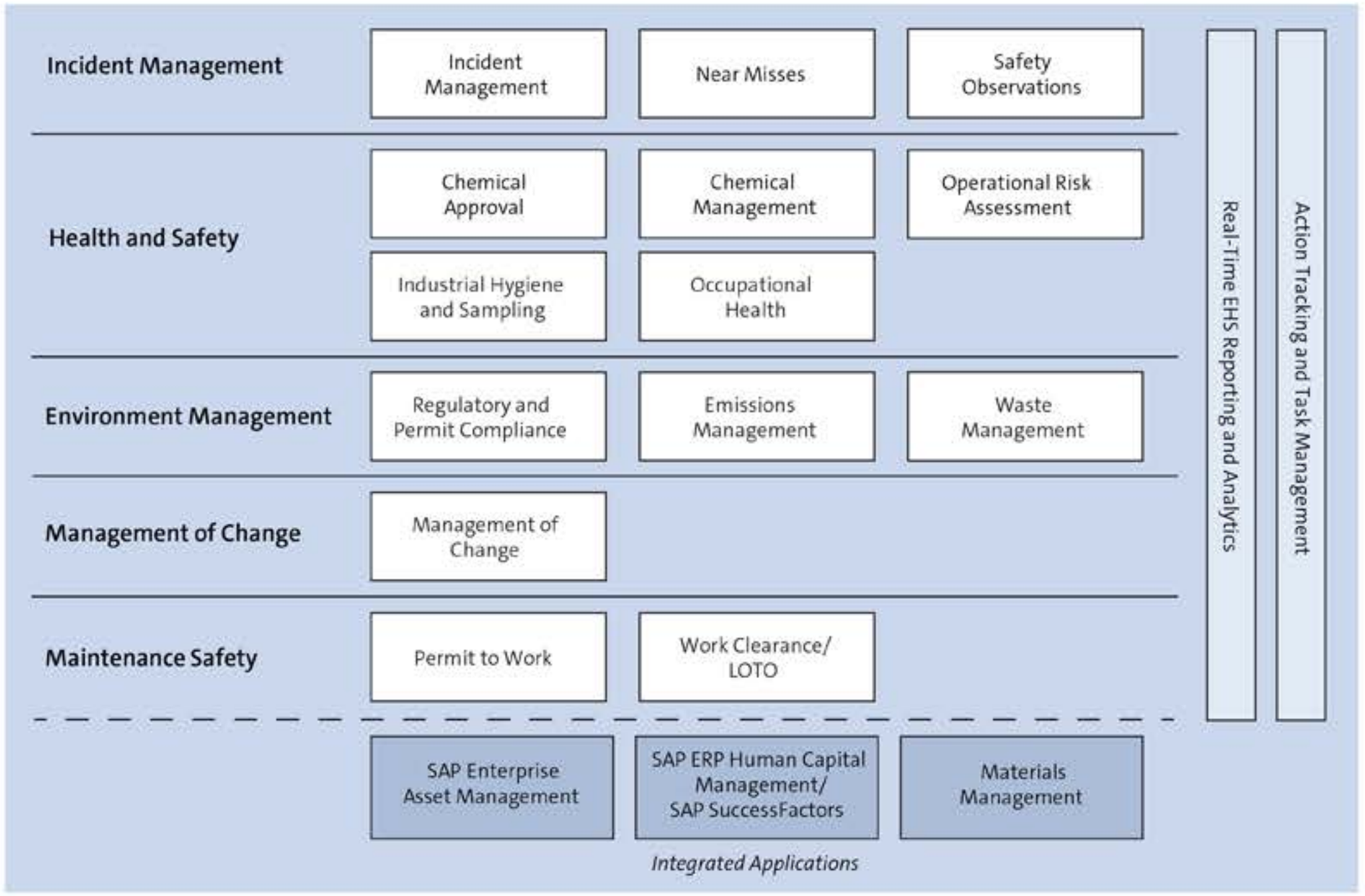


Figure 1.6 Current Product and Capabilities Portfolio within SAP EHS Management

With the exception of SAP EHS Management, health and safety, all of these products (five items listed on the left) and associated capabilities (boxes on the right) are available in an on-premise, private hosted cloud, and public multi-tenant deployment. SAP EHS Management, health and safety is available in all except public cloud, but it is planned to be offered in the public cloud in the near future. It should also be noted that the "Maintenance Safety" item shown in Figure 1.6 isn't an official SAP licensed product on its own. This refers to the maintenance order functionality in Plant Maintenance, which leverages data from SAP EHS Management, health and safety. The Work Clearance Management item is actually a licensed product that augments the maintenance process.

The next few sections in this E-Bite will give details on each of the software products that comprise the SAP EHS Management solution set. Table 1.1 provides a brief summary of each solution.

Product	Description
SAP EHS Management, incident management	Central repository for all types of safety and environmental incidents, near misses, and safety observations. The application drives a lifecycle of incident recording, investigation, root-cause analysis, regulatory reporting, and corrective actions. It can be configured to handled other types of events like security and ethics issues.
SAP EHS Management, health and safety management	Broad scope of processes to enable identification and mitigation of workplace hazards while tracking exposure for employees. This includes chemical management, risk assessments, industrial hygiene, and occupational health.
SAP EHS Management, environment management	Applications providing a repository for all relevant compliance requirements originating from regulations, permits, or company policies. The compliance scenarios also contain the equations for emission calculations and limits that are put in place. Most recently, an app for tracking onsite waste generation and shipping was included.
SAP Management of Change	Application that drives a lifecycle of an operational change request–request, review, approval, and activities to affect the change.
Permit to Work /SAP Work Clearance Management	Functionality within the Plant Maintenance process to enable a permit request and approval step for overall control of work.

Table 1.1 Objective and Functional Description of all Products that Make up SAP EHS Management

1.3 Design Philosophy of the Integrated SAP EHS Management Platform

The mobile-optimized apps and the analytics are examples of one of the key tenants of design philosophy for the SAP EHS Management applications; all functionality access is based on the role of the user and associated system authorization. This fosters an implementation approach centered on integrated business processes and the actors within those processes. A user will be expected to do certain things within the software as part of a larger process, and that user will be given the necessary system authorizations for the role they play. If certain steps are expected to be done on the

shop floor or in any other distributed fashion, a mobile app may be provisioned for those workers. At the other end of the spectrum, where corporate-level planners are reviewing enterprise datasets to evaluate strategy and performance, their roles may focus more on the analytical outputs available with SAP EHS Management. The EHS practitioners would be authorized to see abfnd run all steps in all related EHS processes. The objective is to take a set of disconnected stakeholders and have them move forward together as part of an integrated process. Figure 1.7 shows a screenshot that illustrates the real-based nature of the apps and also an example of a mobile-optimized view.

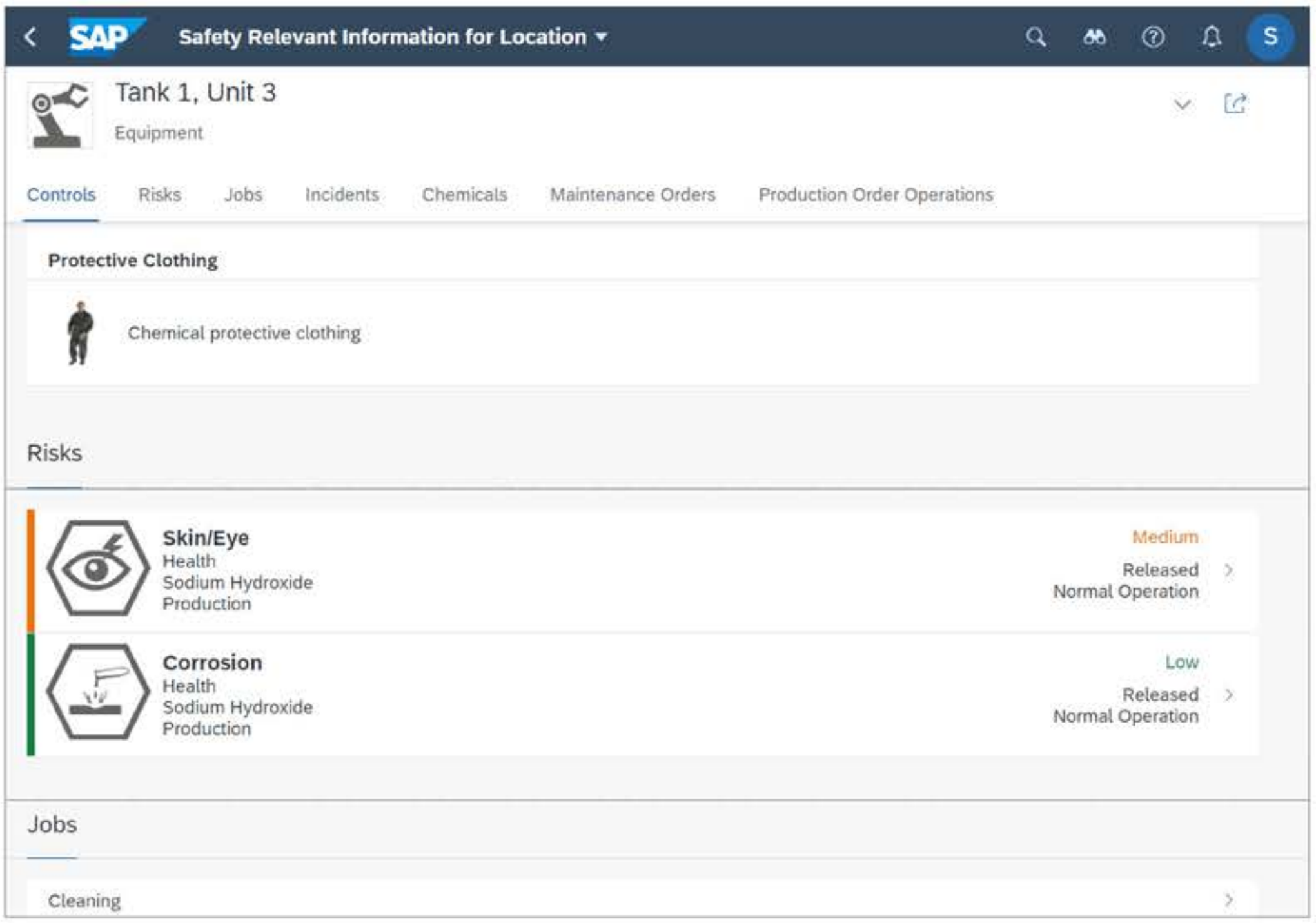


Figure 1.7 Mobile-optimized App View

Another aspect of design philosophy is how the system is configured to match specific business processes or requirements. SAP EHS Management is part of the digital core of SAP S/4HANA and follows all of the standards and technical guidelines within that. The user has some flexibility on the transaction screens to tweak the user experience to their liking; however, significant changes to the data model, workflows, and application structure are not provisioned at the user level to prevent customization

that results in broken integrations, inconsistent data capture, reporting, workflows, etc. There are more details on system configuration and customization options in Section 7 of this E-Bite.

2 Incident Management

The incident management functionality within SAP EHS Management was the first to be built in the EHSM component extension, making it the most mature in the portfolio. That happened in 2010, and now it has become the most implemented module within SAP EHS Management. Part of that is because incident and injury tracking has usually been one of the first topics or use cases that customers want to address when revamping their safety management approach or upgrading systems. Customers will enjoy greater control over investigation efforts, valuable integration to supporting processes like asset management, and more visibility into corrective actions.

One objective of the application is to provide a central repository for all types of operational incidents, such as worker injuries, environmental spills, violations, security issues, etc. A second objective is to drive a consistent process regardless of the type or complexity of the event.

The purpose of this section is to summarize both the business process and functionality that is offered within SAP EHS Management, incident management. To do this, we'll describe each major step in the process and list key features along the way. At the end we'll discuss outputs from the process, such as regulatory reports and analytics.

Note

Earlier in 2022, SAP announced the availability of the SAP Cloud for Sustainable Enterprises, a portfolio strategy and licensing flex bundle to allow customers to purchase applications that were part of the overall SAP solutions for sustainability strategy. SAP EHS Management, incident management is part of the social responsibility aspect, focused on workplace safety.

2.1 Business Process

SAP EHS Management, incident management supports a business process partially driven by workflows that cover the full lifecycle of an actual incident, a *near miss* (an incident or event where no injury occurred) or a record called a *safety observation*, the latter meant to enable a more proactive step of recording a hazardous condition or hazardous act which may eventually lead to an actual incident or injury. While the system allows for task tracking and real-time analytical views at any step along the process, we'll show these functions as outputs at the end of the process. Figure 2.1 provides an overview of the incident management process. We'll walk you through each of these steps—incident entry, investigation, corrective actions, incident reporting, and analytics—in the following sections.

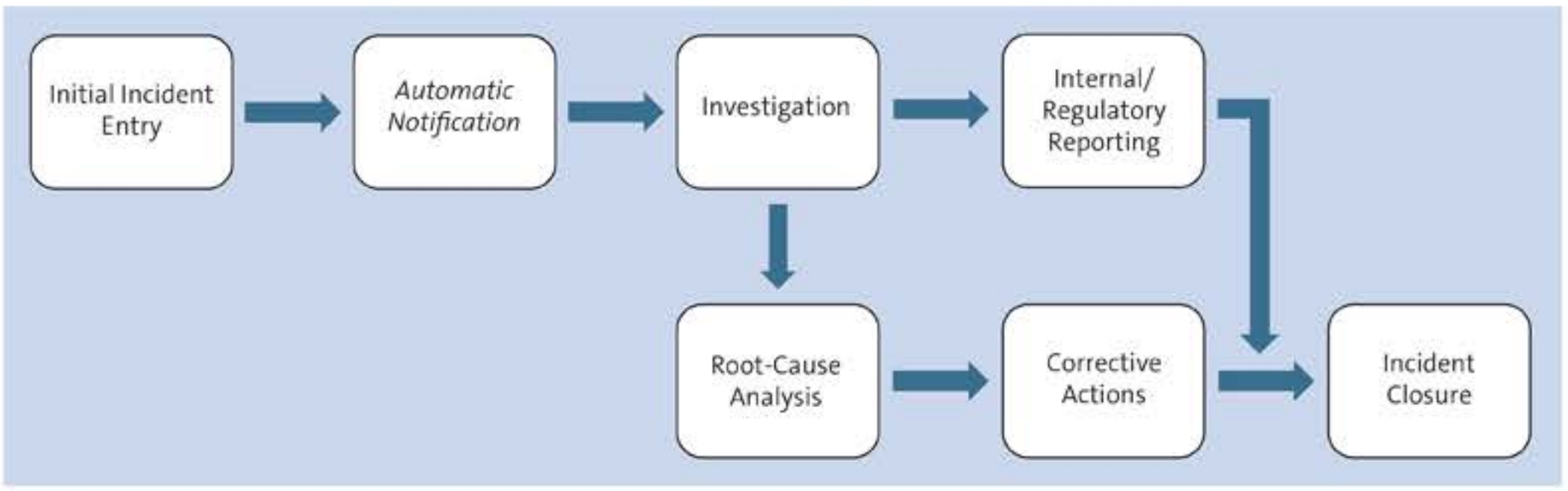


Figure 2.1 Incident Management Process Flow

Incident Entry

Any user who is authorized to create an incident, near miss, or safety observation record can open the **New Incident** screen by clicking on the **Report Incident** tile from their SAP Fiori launchpad. This same function is available on a mobile device either through the SAP Fiori Launchpad or as a dedicated app with offline capability (see Figure 2.2). The dedicated app approach requires additional software from SAP, explained in the software documentation. A third option for on-premise deployments is an offline form powered by SAP Adobe Interactive Forms, which provides a user experience similar to a paper form. From any of the entry methods, once the initial basic data is submitted, the system launches an SAP Workflow-driven notification process to the appropriate users as configured in the system. Those users are then authorized to continue moving the process forward by capturing more information about the incident in the main incident record. A fourth option is creating a record automatically from another system or device via a standard API that is provided.

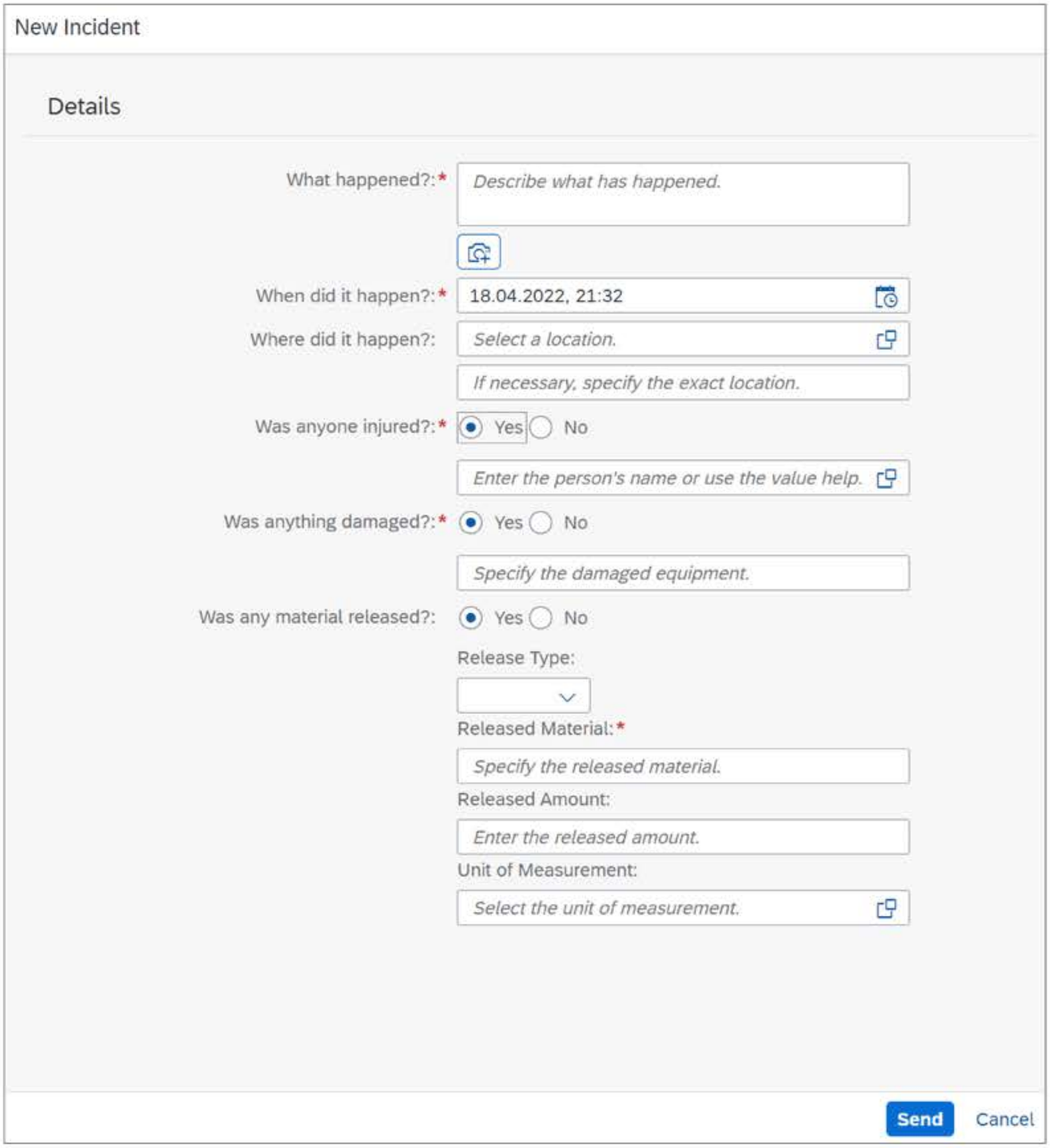


Figure 2.2 Initial Screen for the Report Incident App

This application comes pre-configured to support the following incident types or **Groups**, which are part of the **Change Classification** screen for the incident, as shown in Figure 2.3.

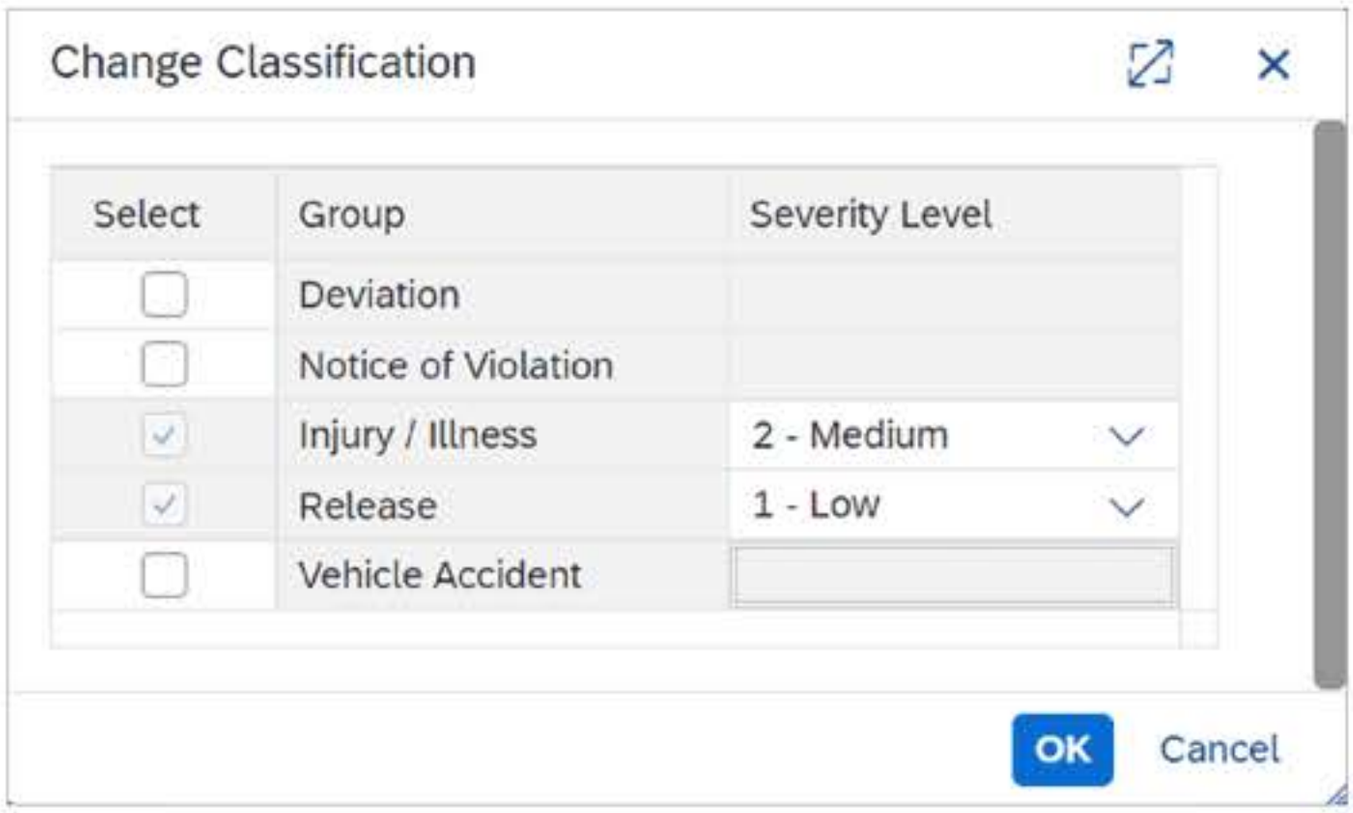


Figure 2.3 Change Classification Dialog Box

The **Group** selections for the incident can really be considered aspects of the incident event. What we mean by this is that a singular event can potentially result in a safety injury, an environmental release of chemicals, multiple violations, among other things. The system will or the user should select all of those incident groups that are relevant based on what happened. There's an option to indicate a **Severity Level** for each group as well.

The selection of incident groups does have significant impact on the overall process and function of the application. You'll see that certain tabs will appear or be suppressed based on the incident group. For example, if the **Release** checkbox is not selected, the **Release** tab won't be show on the main screen. This helps to ensure that the user only sees data elements that are relevant to the incident. The **Group** selection for the incident also can drive the default Investigation steps based on IMG configuration.

Investigation

The **Investigation** tab of the incident record contains three key functionalities. The first is the investigation header that documents the investigation lead, reason for investigation, guidance documents, and scheduling. The second is the list of specific investigation steps, based on the incident type, that are to be assigned to individuals and performed. These investigation steps are managed as tasks driven by SAP Workflow. The third key functionality is a special type of investigation step for root-cause analysis. In SAP EHS Management, incident management, there's no set methodology for determining root-cause; the application is agnostic. However, there is a root-cause hierarchy configurable to match whatever methodology is utilized. Multiple

root-causes can be selected, and each one can have multiple corrective actions assigned to it. See Figure 2.4.

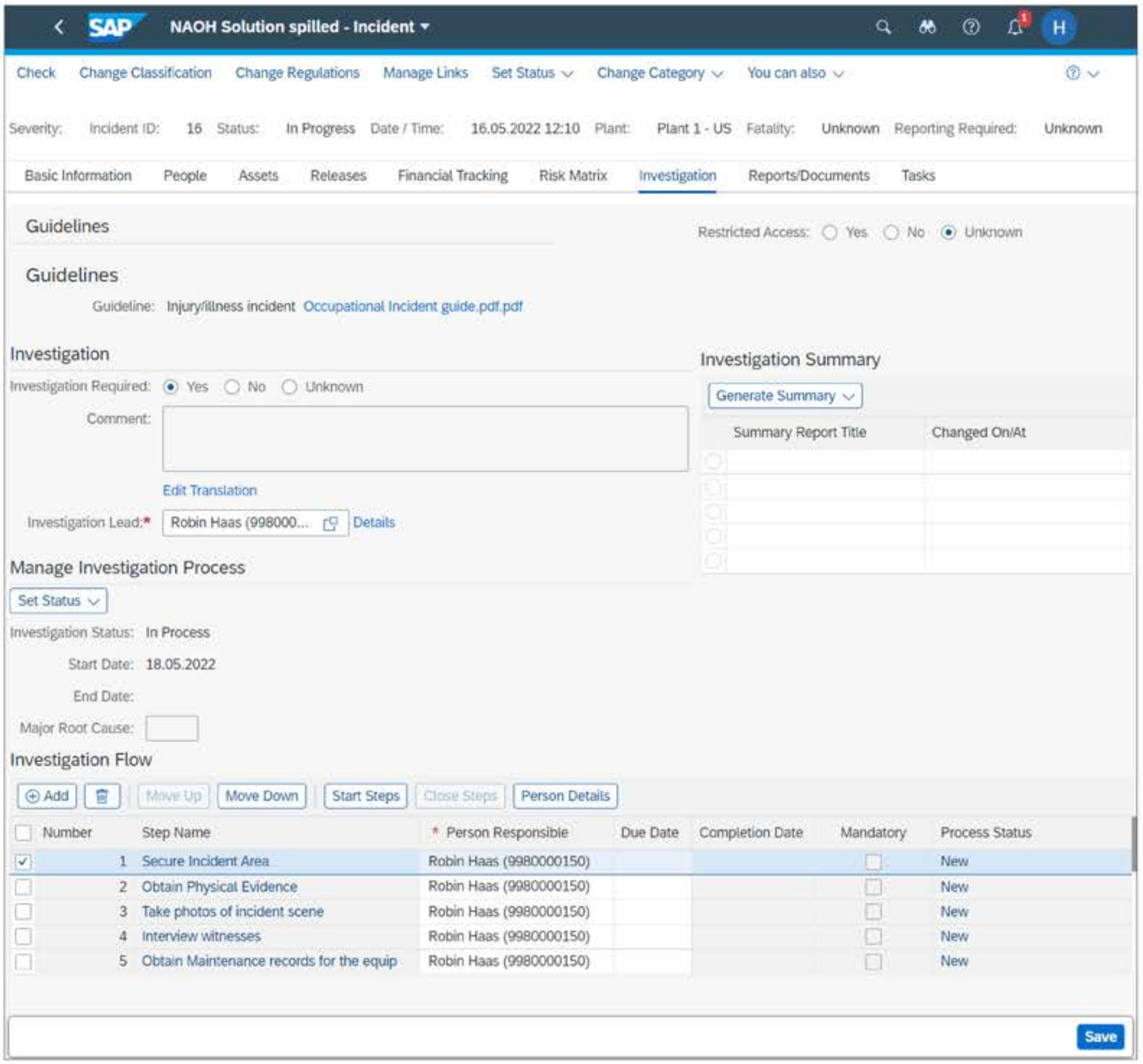


Figure 2.4 Example of Investigation Tab

Corrective Actions

All types of corrective and preventative actions can be assigned and driven by the workflow engine at any point in the incident lifecycle. You can find the full repository of relevant actions or tasks on the **Tasks** tab of the incident record. This is also where a multi-step process for creating, triggering, and monitoring tasks can be done. See Figure 2.5. Specific type of tasks, such as maintenance, leverages integration to Plant Maintenance, where work notifications can be processed to ensure those types of tasks are assigned to the personnel who is actually responsible to do the work.

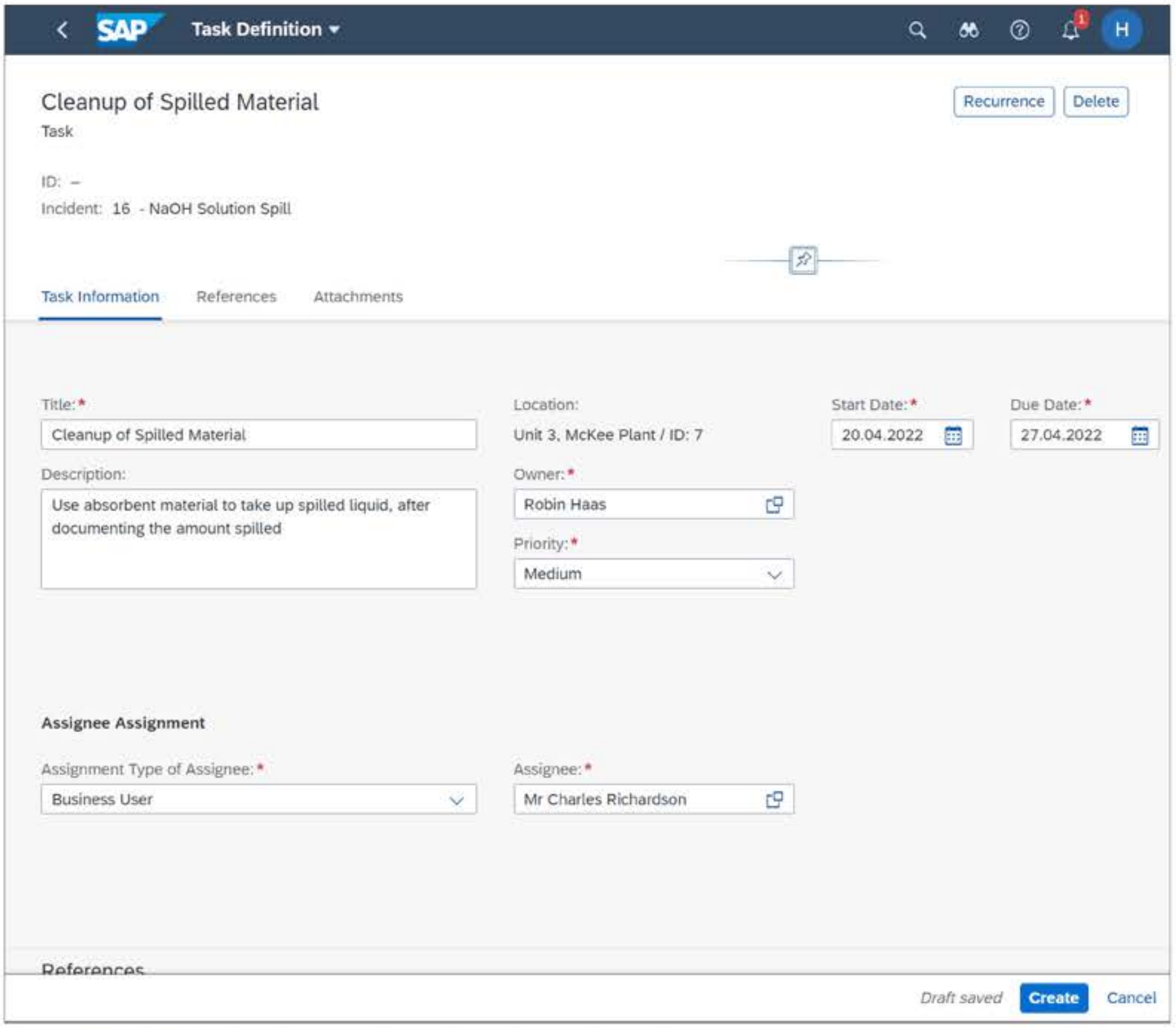


Figure 2.5 Task Creation Screen for Incident Corrective Actions

Incident Reporting

Most countries around the world who have a structured set of safety regulations that companies need to comply with will recommend or require that those companies report certain types of incidents to the regulatory agency. While there's a slow evolution to electronic submittal, the traditional mechanism to report this information has been through a form-based process. SAP EHS Management, incident management contains a function to generate regulatory forms using Adobe Forms technology. When a user takes the action to generate a report, data that's entered in the incident records can be pulled and displayed on the form selected in either a default language or one selected by the user. The generated forms are then automatically stored on the **Reports/Documents** tab. The SAP EHS Management, incident management application comes standard with the OSHA 301, 300, and 300A forms that are

required in the United States, and also the Berufsgenossenschaft form that's required in Germany. Various implementation packages are available that offer pre-built forms for other countries and jurisdictions, and custom forms can always be developed on a project basis using the same Adobe Forms technology.

Analytics

No incident management process is effective unless analysis is done both on leading indicators and lagging indicators. As part of the digital core of SAP S/4HANA, the SAP EHS Management applications offer options for real-time, in-memory analytical outputs. There are basic tabular data explorers, the ad-hoc charting tool, AFP, seen in Figure 2.6 below, real-time incident rate calculations, and standard content available for SAP Analytics Cloud. Reporting views include incident data, injury data, root-cause, corrective actions, and many others.

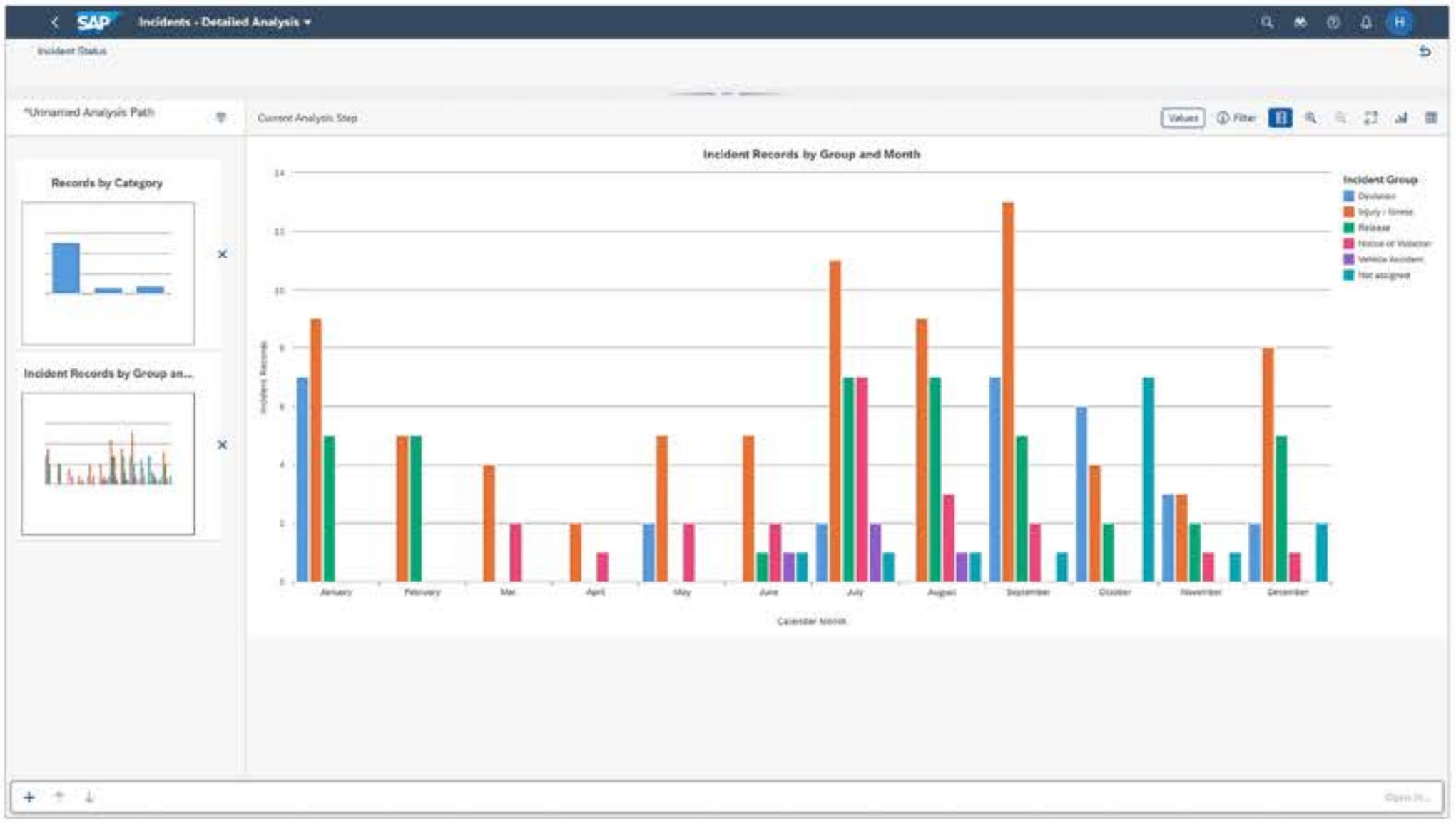


Figure 2.6 Analytical View of Incident Data from SAP EHS Management

2.2 Data Model Description

Table 2.1 describes the purpose and structure of the tabs on the main incident record that make up the majority of the data model of SAP EHS Management, incident management. The relevant subtabs are listed in the "Description" column. In addition to

the tab data elements, there are a set of incident header elements such as ID, record status, relevant regulations, and incident group classification.

Header Tabs	Description
Basic Information	Contains data from the initial incident report and facts such as location, time, and description
People	Tab that captures all those involved in an incident, and their role. The role types are fully configurable. This is also where injury data is recorded. Multiple injured persons can be listed for a specific incident, and each injury record has additional authorization checks to protect sensitive personal information.
Assets	Tab that captures all assets involved in an incident, whether they be equipment, vehicles, or other resources. Integration with equipment master records is provided here if your SAP instance stores them. Information regarding asset damage is also recorded.
Releases	If the **Release** incident type is selected, this tab will appear and be part of the incident record data structure. It allows the user to enter information on materials that may have been spilled or released into the environment, clean-up activities, and regulatory impact.
Notices of Violation	If the **Notice of Violation** incident type is selected, this tab will appear and be part of the incident record data structure. It captures information for those times when a citation has been written based on a non-compliance or other issue during operations. The agency, the associated cost, and other pertinent details are there.
Financial Tracking	This tab allows the user to enter in both inbound and outbound payments that were a result of the incident. Examples include payments to third parties for cleanup, legal fees, or compensation. Integration is available to post these transactions to the Finance and Controlling functions within SAP.
Risk Matrix	A tab capturing a qualitative risk assessment of an incident occurring and re-occurring after corrective actions are in place.
Investigation	A tab containing all information, guidance, and investigation steps for the incident. It also provides an on-demand summary Adobe form that lists out all details of the investigation effort. See details in the Investigation section.

Table 2.1 List of Tabs that Comprise the Main SAP EHS Management, Incident Management Screen

Header Tabs	Description
Reports/Documents	While documents, pictures, and other files can be attached at various other parts of the process, this tab shows all files in one place, the file type, location, and other parameters. In addition, the forms and regulatory reports generated by the system are automatically shown in this tab.
Tasks	Similar to documents, tasks can be set up at many points in the process and this tab acts first as a centralized view of all tasks related to the incident—corrective action or otherwise. The source or trigger for the task, such as an identified root-cause is captured. Finally, this tab serves as the launchpad for creating task records. See the Corrective Actions section for more details.

Table 2.1 List of Tabs that Comprise the Main SAP EHS Management, Incident Management Screen (Cont.)

3 Health and Safety

SAP EHS Management, health and safety management was the second product developed within the SAP EHS Management component extension between 2012 and 2014, soon after SAP EHS Management, incident management was released. Due to the nature and relevance of the risk assessment topic, the functionality and scope of this software product is much broader than incident management and is comprised of multiple (and somewhat independent) processes and applications.

The applications together enable an integrated platform approach for identifying all hazards in the workplace, assessing the risk, and taking action to mitigate those risks. That is the overall objective for the product. There is value in the integration, as chemical data, ERP location data, equipment masters, personnel data, incidents, and utilization of the same task management engine as incident management all drive an end-to-end process for risk mitigation to ensure a safe workplace and a healthy workforce.

The purpose of this section is to summarize both the business processes and functionality that is offered within SAP EHS Management, health and safety management. To do this, we'll describe key steps in each process and list key features along the way for chemical management, risk assessment, workplace sampling, and occupational health. At the end, we'll discuss outputs from the process, such as regulatory reports and analytics.

3.1 Chemical Management

SAP EHS Management, health and safety management contains two processes related to managing chemicals that are being brought onsite and/or being utilized by employees as part of their job function, resulting in potential hazards and exposure risks. The first process is a straightforward approval workflow starting with a user requesting a chemical be put in the system and that requested getting routed to approvers with review criteria. This process is configurable based on SAP Workflow, the EHS configuration tables, and the selection of the individual who is authorized to request and approve. The second process is related to managing the chemical data itself, shown in Figure 3.1.

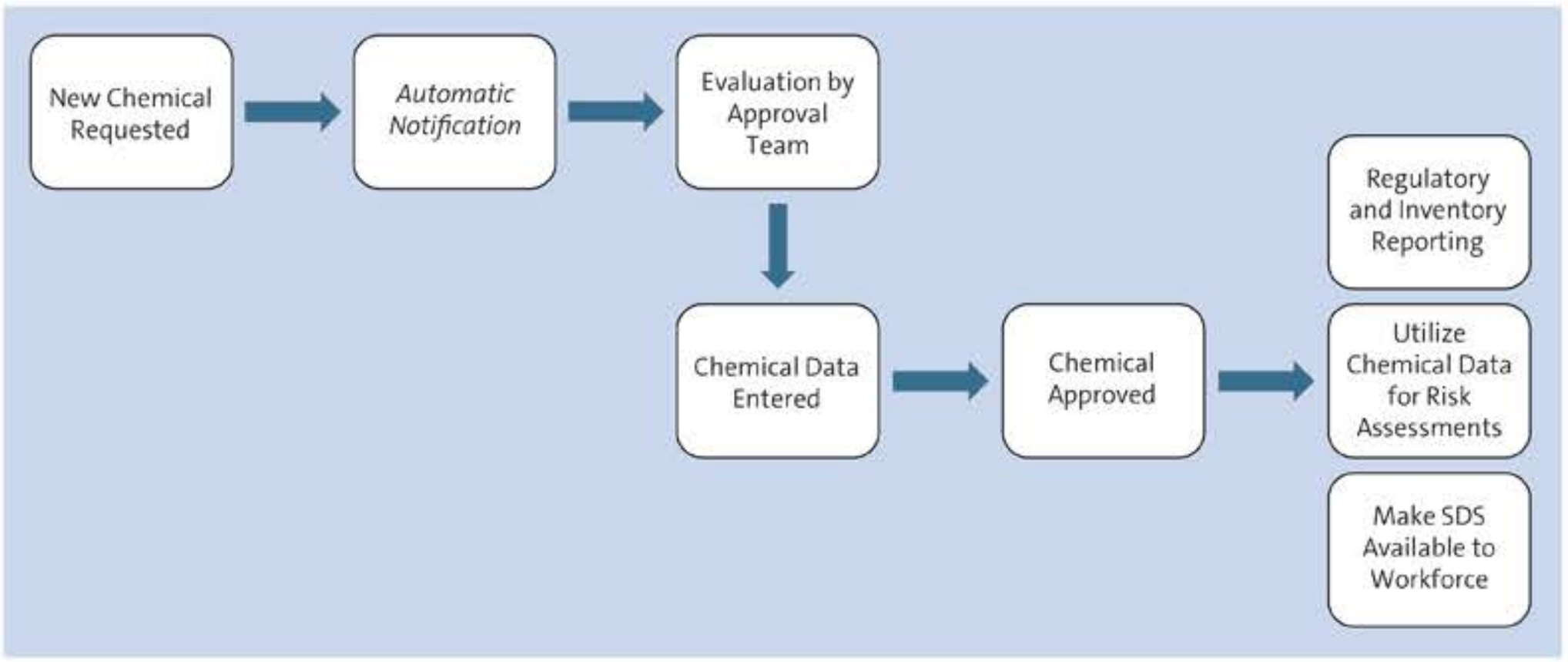


Figure 3.1 Approval and Chemical Management Process in SAP EHS Management

You'll see this sometimes referred to *hazardous substance management* and there's some relevance and overlap with the outward-facing process for SAP S/4HANA for product compliance. SAP EHS Management offers a repository to store all relevant chemical data, assign the chemical to locations, and material masters to help track inventory. It then makes this data available to the risk assessment function to support exposure risk assessments, worker right-to-know efforts, and emissions calculations. Files such as vendor safety data sheets (SDS) can be attached to the chemical records, and SDS or other safety instructions related to the chemicals can be provided to workers through a standard mobile-optimized tile and app called Display Relevant Info.

Besides providing workers with required information about the chemicals onsite, companies may need to report the inventory details of what they are storing. The chemical management functionality leverages direct integration to material masters

and inventory storage locations to provide a real-time view of inventory and also support submittal of regulatory reports like the SARA Title III, Section 311 and 312 in the United States.

Note

The chemical object as described in this E-Bite is based on what is available in the on-premise deployment of SAP EHS Management. In the cloud versions, the chemical object will be replaced by a more centralized item called the *chemical compliance info* object which will be harmonized with functions in product compliance and other parts of EHS like emissions calculations and waste management.

3.2 Risk Assessment

As stated in the beginning of this section, the overall objective of SAP EHS Management, health and safety management is to identify hazards, assess risk, and mitigate that risk. The risk assessment process and function is the central component which achieves this. It links all other processes and answers the fundamental questions of what the risk is, where it is, how severe, and what is being done to control it. Figure 3.2 shows the main steps.

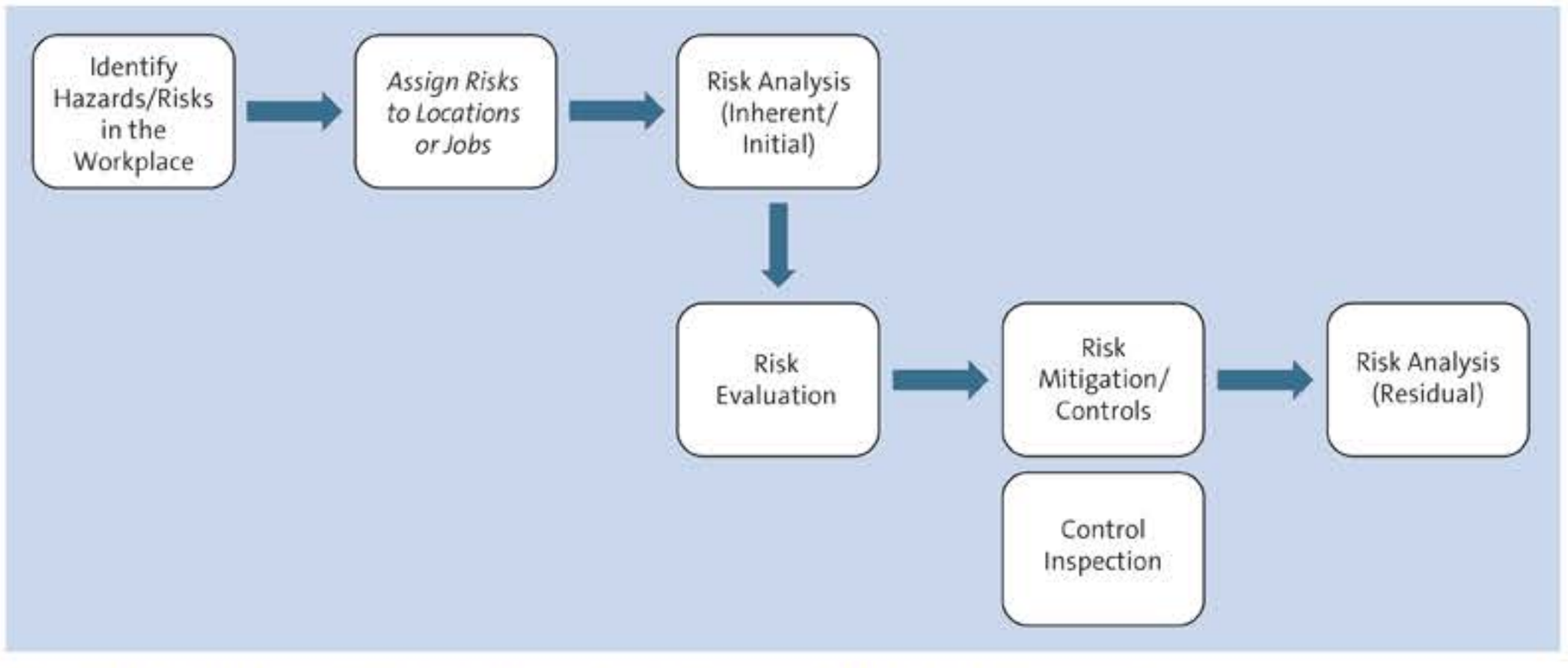


Figure 3.2 Risk Assessment and Mitigation Process in SAP EHS Management

Hazard identification is a key step and there is a dedicated SAP Fiori app that is mobile-optimized to enable any employee with authorization to enter hazard information in the workplace and start the risk assessment process. The user can enter an initial opinion on the severity of the risk, potential impacts, and any risk controls that are already in place. From there, a risk assessment project can either be created or the

risk can be added to an existing one. The assessment project is the primary object in the application containing a list of all hazards and risks being assessed, the location or job that is relevant, the steps being taken to assess risk, the resulting risk ratings, and any new controls to be put in place (see Figure 3.3). The controls can actually be triggers for other processes such workplace sampling and medical services, described in the next sections.

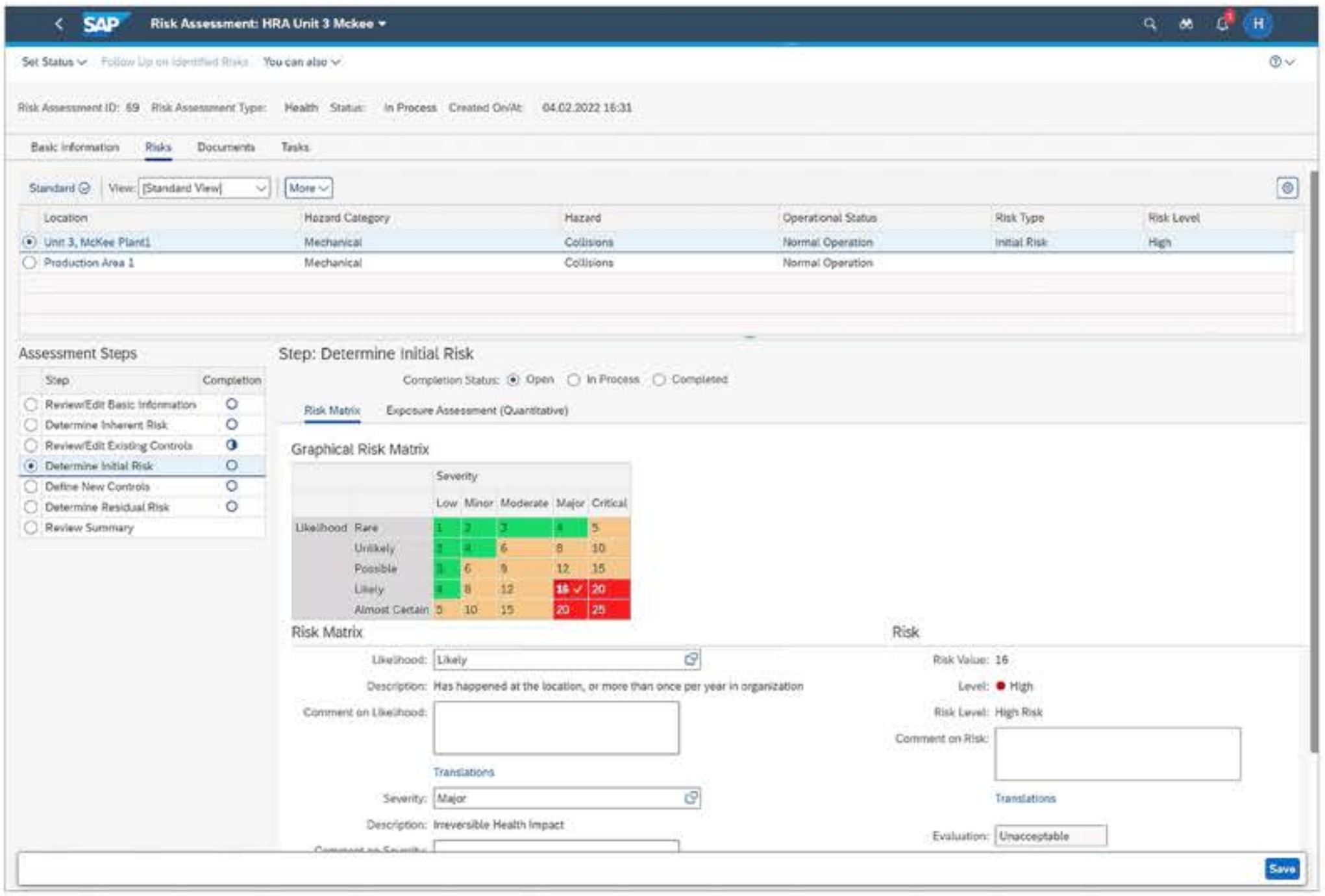


Figure 3.3 Main Risk Assessment Screen

3.3 Workplace Sampling

The risk assessment process within SAP EHS Management, health and safety management is more of a qualitative approach to arrive at risk ratings. The workplace sampling features provide a way to include quantitative data into that assessment process, especially for exposure risks. This sub-process of sampling can be utilized either to help determine the level of risk, or as a type of control to monitor the specific hazards creating the risk on an ongoing basis. The level of noise in the workplace is a good example of a hazard that truly needs quantitative workplace sampling to perform accurate risk assessments.

You start with creating a sampling campaign that will define the types and number of samples, the sampling equipment, the hazards being tracked, and other planning information. From there, the campaign is released and workplace sampling can begin. Users are able to enter results manually or leverage a generic import routine to build specific mappings to laboratories or sampling devices and import the results data electronically. If occupational exposure limits (OELs) or other regulatory limits are entered in the system, the workplace sampling results are compared automatically to those limits as one indication of the level of exposure and ultimately the level of risk (see Figure 3.4).

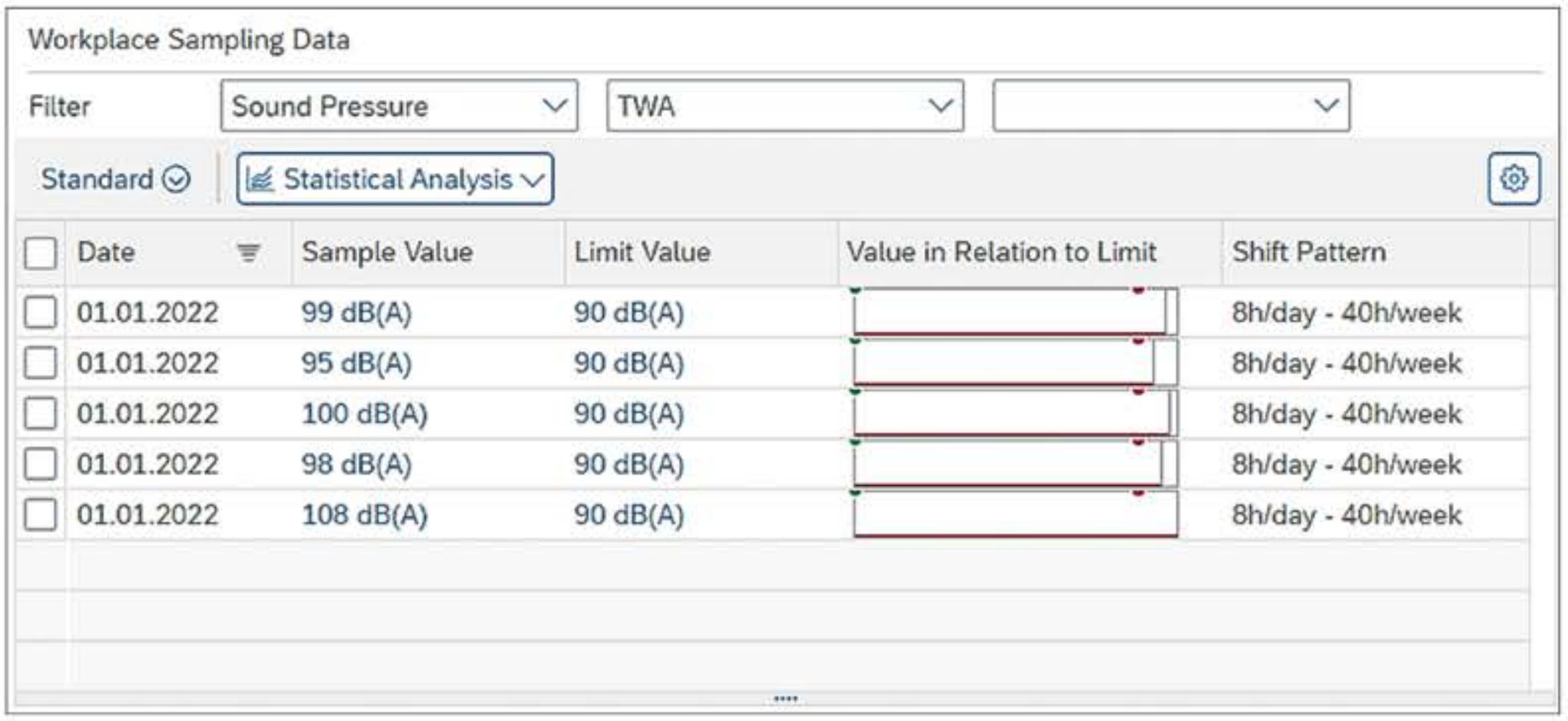


Figure 3.4 Sampling Results Compared to Occupational Exposure Limits

If desired, the workplace sampling data can also be used to create exposure history reports for individuals and be the basis for assigning health surveillance protocols within the occupational health process.

3.4 Occupational Health

There are two aspects of the occupational health process: reactively dealing with workplace injuries and illnesses, and proactively monitoring worker health based on identified risks and/or other factors.

Figure 3.5 shows the steps for leveraging known information to determine which employees should be placed into whichever health surveillance protocols are necessary, scheduling required medical services (tests, treatments, etc.), performing those

services and tracking results, and finally processing all of the associated case information for each employee. Those final steps could include documenting restricted duty requirements, mapping out return-to-work plans, scheduling further services, and addressing administrative items. Keep in mind that the health surveillance protocols can be set up in configuration to handle topics not related to workplace hazards; they could be for placement into certain jobs (fit-for-duty, drug testing), and worker wellness initiatives.

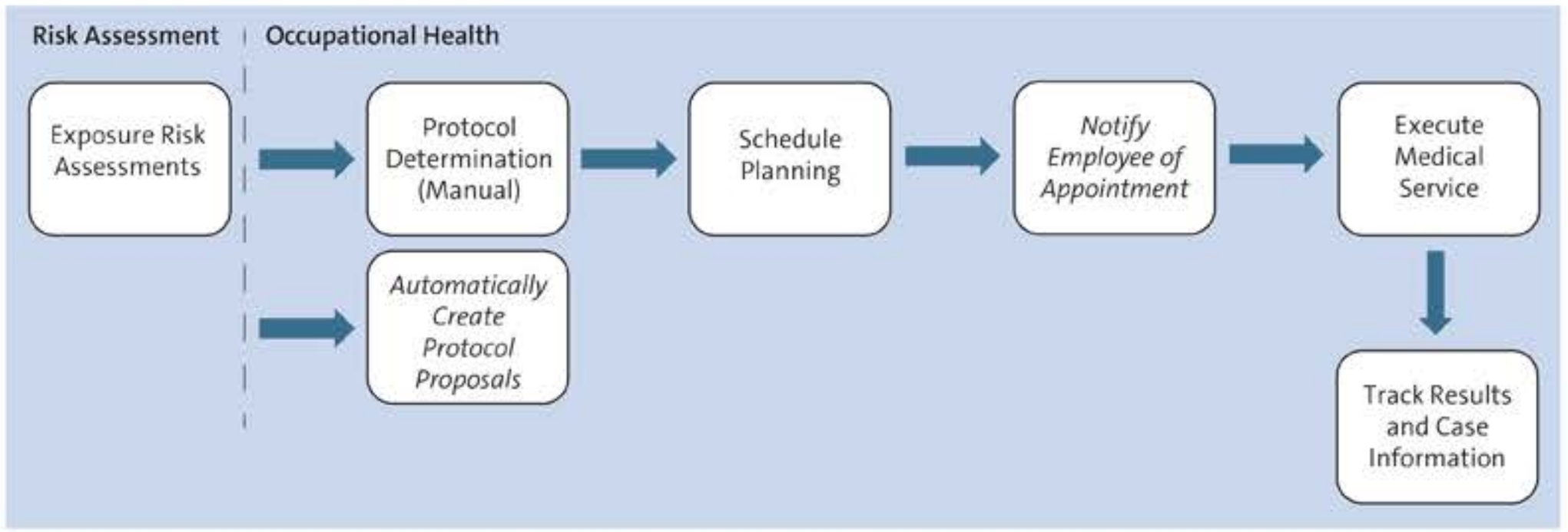


Figure 3.5 Process Steps after Risk Assessment for Occupational Health

You can also utilize the occupational health functionality to address a situation where an injury or illness has occurred and the employee requires medical attention and possibly rehabilitation. This process is one of the integration points with SAP EHS Management, incident management.

Note

The occupational health functionality was part of the standard SAP EHS Management, health and safety management offering in the EHSM component extension. It was deprecated in the migration to SAP S/4HANA. It's now available through the license purchase of what is called a *Repeatable Custom Solutions (RPC)* package, maintained by SAP. For the purposes of this E-Bite, we'll include it as part of the functional scope of health and safety.

3.5 Data Model Description

SAP EHS Management, health and safety management covers a broad set of processes, driven by a primary set of objects that are interconnected in multiple ways to help meet that objective of identifying all risks and mitigating that risk. Table 3.1 contains these objects and a brief description.

Main Objects	Description
Location	A central SAP EHS Management object that allows you to build a hierarchy that reflects the organization, assets, facilities, other entities needed to drive the EHS processes. It can be linked to other hierarchies in SAP such as functional locations, organization structures, plants, and people.
Chemical	Data record that captures all necessary information for a specific chemical or substance that is present onsite or that workers are being exposed to it in some way. Composition, naming, regulatory status, handling, and other information is all in there along with assignments to material master records and locations to help track inventory.
Hazard	The source or situation that can do harm. Within the risk assessment process, it is actually the first piece of information identified
Agent	The physical entity causing the hazard and subsequent risk. A chemical with hazardous components, noise, vibration, and heat are examples of a hazard agent.
Impact	Basic data point validated against the hazard that defines possible consequences if the risk is not controlled. If a flammable chemical is stored onsite, one possible impact is fire.
Risk	The intersection of the hazard, the agent, the methods of use, the probability of impact, and the severity of the impact. Analysis and validation of these factors let you arrive at a definition of a risk and the level of risk, denoted by a specific risk rating.
Risk Assessment	A broader data object that brings context to the process by allowing users to group risks being assessed into projects with location or job, the personnel involved, the reason to do the risk assessment (including direct linkage to items like incidents), time period, and any relevant regulations that are governing or influencing the assessment process.
Control/Control Catalog	One or more controls can be assigned to hazard and the associated risk level. Primary types include engineering, process, or organizational controls that help reduce risk. You can configure a full catalog of controls based on the types of hazards being tracked, and then this becomes a selection list when running risk assessments. One useful integration with Incident Management is the ability to track the effectiveness of controls in different ways, one of which is linking a valid incident record as a data point to show whether a control had the desired effect.

Table 3.1 List of Primary Data Objects within SAP EHS Management, Health and Safety Management

Main Objects	Description
Task	A central and very important object utilized throughout SAP EHS Management functionalities, including Health and Safety. An EHS task contains all of the information one would expect for driving a corrective action effort, compliance tasks, preventative measures, etc. Once a task is entered in the system, the process is driven by SAP Workflow to notify and remind individuals assigned to a task, enable data entry, and close the tasks.
Sample	The record denoted by a sample ID along with specific data for the sample such as medium, duration, calibration documents, analyte, results, and the person(s) responsible for that sample.
Sampling Campaign	The sampling campaign is a record that enables the overall planning and execution of sampling. You can set the time period, the location, the responsible parties, the sampling methods, and the sampling targets.
Health Surveillance Protocol	A configuration object that captures necessary tests or other medical services, their frequency, relevant jurisdictions, and other factors based on regulatory requirements, company policy, or other factors. A program for hearing conservation would have a protocol configured for noise, and then require hearing tests at a certain calendar frequency.
Medical Service	The primary data object within occupational health where medical and case history can be stored for each employee. This includes assigned protocols, tests administered, test results, diagnosis, vaccinations, case notes, duty restrictions, and more. Additional layers of security and authorization are placed on this data due to its sensitive nature.

Table 3.1 List of Primary Data Objects within SAP EHS Management, Health and Safety Management (Cont.)

4 Environment Management

SAP EHS Management, environment management was third and final product developed within the EHSM component extension version 6.0 between 2014 and 2016. The functionality and scope of this product included both the compliance as well as emissions aspects from an environmental performance standpoint. In other words, this product allows for managing requirements arising from regulations, permits, and policies; also, it provides the capability to manage air and greenhouse gas (GHG) emissions inventories, water, and wastewater quality monitoring. Recently, the business process for cradle-to-grave waste tracking was introduced in the SAP S/4HANA SAP EHS Management, environment management product.

The applications—compliance management, emissions management, and waste management—within the SAP EHS Management, environment management product enable an integrated platform to identify regulatory requirements, company policies, and operational permits; to utilize these requirements to drive compliance tasks; to manage emissions; to track limits; and to report deviations.

The purpose of this section is to summarize both the business processes and functionality that is offered within SAP EHS Management, environment management. To do this, we'll describe key steps in each process and list key features along the way for compliance management, emissions, and waste management. At the end, we'll discuss outputs from the process, such as regulatory reports and analytics.

4.1 Compliance Management

SAP EHS Management, environment management provides the capability to centrally organize and manage compliance requirements that can be driven by regulations, operational permits (for example, Title V), and/or internal policies or procedures. The compliance requirements form the core of the application and drive the downstream process to support the full life cycle of compliance-driven tasks and deviations or exceptions reporting.

As shown in Figure 4.1, compliance management is a linear process which starts with the creation of the compliance requirement repository to drive the downstream compliance process. This repository of compliance requirements can be of three types: regulations, permits, and policies. They can be either created manually (for example, permits and policies) or can be retrieved as regulatory content (for example, regulations) from a third-party solution.

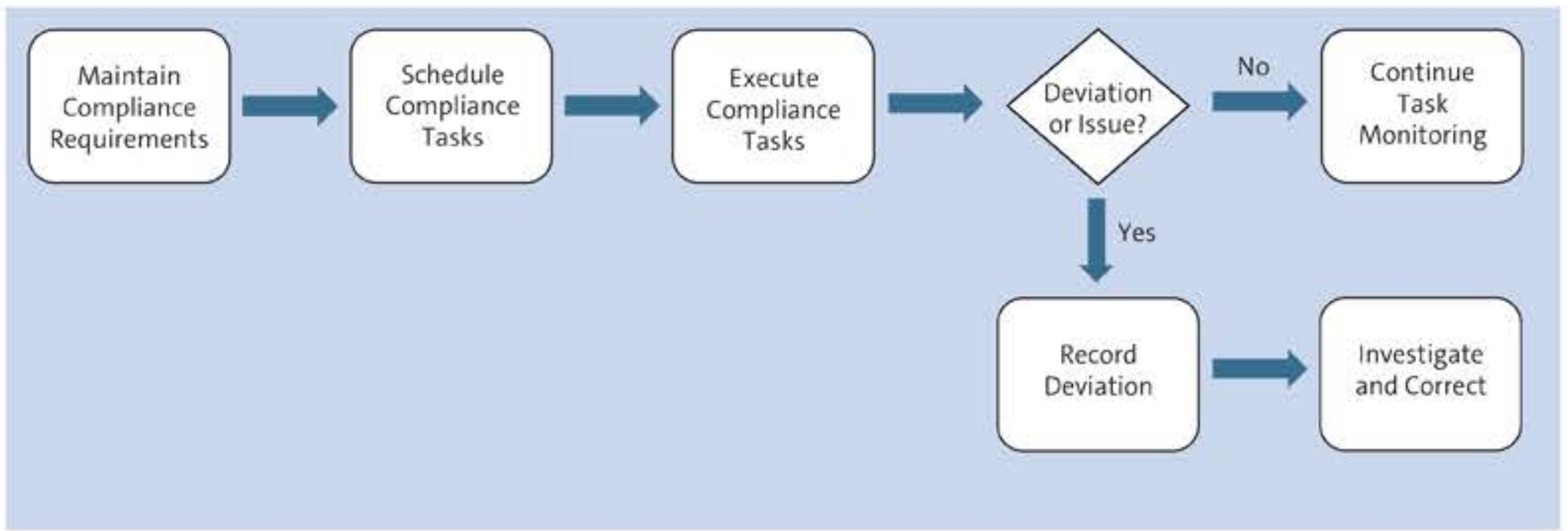


Figure 4.1 Key Steps for Tracking Compliance Requirements

Once the repository for compliance requirements is maintained, compliance tasks can be defined, scheduled, and assigned from the compliance requirement. The scheduled tasks are routed to the My Inbox app of the assignee and can be either completed, forwarded, or suspended by the assignee.

If a non-compliance is identified, a deviation is recorded and investigated. Deviation tracking and investigation is performed in the SAP EHS Management, incident management application. You can utilize the incident process to do investigation, root-cause analysis, and corrective actions if the deviation is deemed serious enough to warrant such effort. The tasks related to compliance activities can be monitored using the Task Calendar app, as shown in Figure 4.2. With this app, the tasks for the team can be planned in a calendar view. Tasks can be reassigned and/or rescheduled. Finally, all the tasks scheduled for compliance management can be monitored using the Monitor Tasks app or the Compliance Analysis applications to provide a quick snapshot into the progress of the scheduled tasks (for example, overdue tasks, scheduled tasks, canceled tasks, and completed tasks).

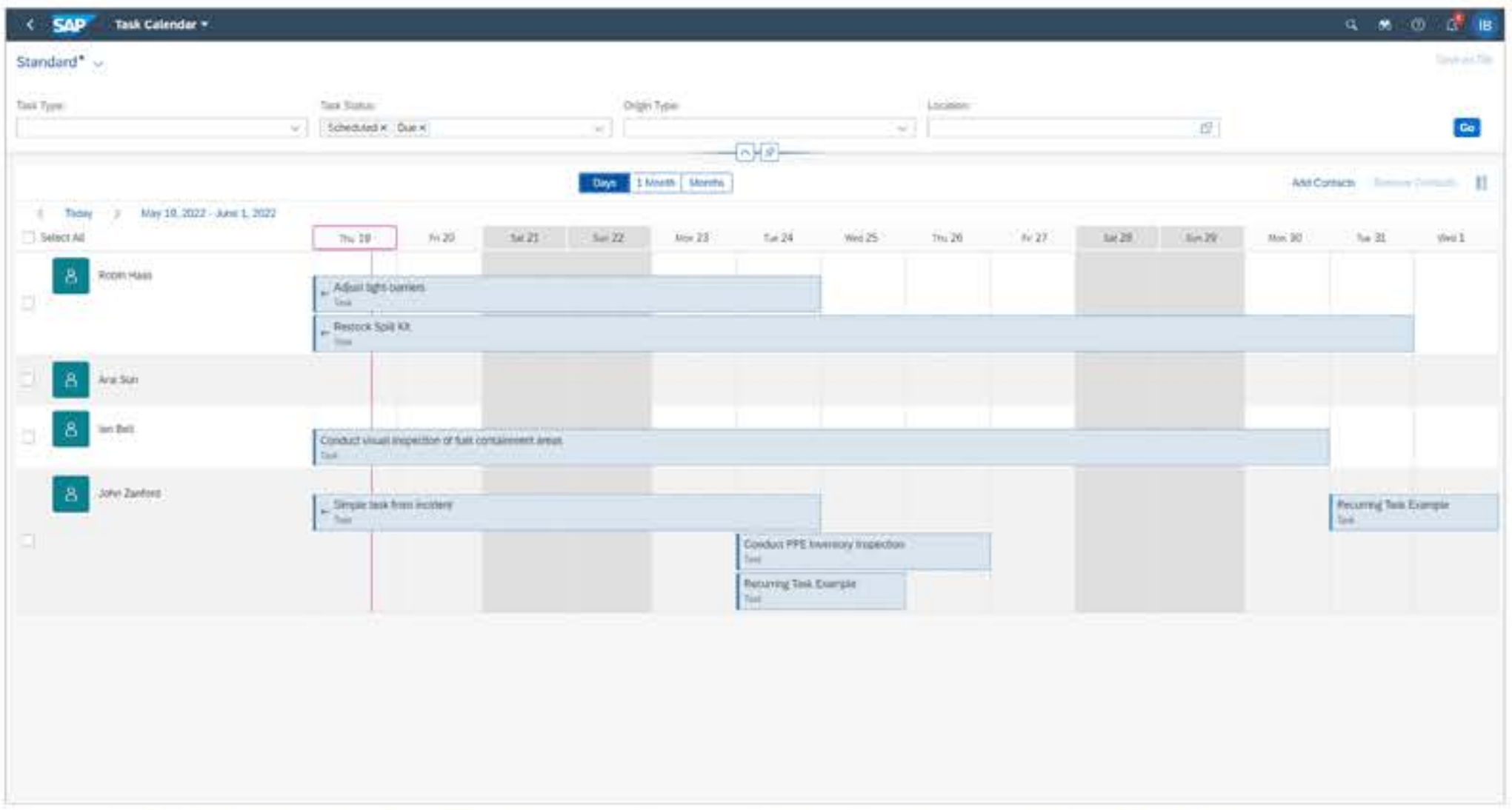


Figure 4.2 Task Calendar App Displaying all Active Tasks Running within SAP EHS Management

Note

Compliance management is available with a built-in option for integration to SAP content provider partner RegScan and their RegScan One solution. Integrations with other content providers can also be built.

4.2 Emissions Management

Emissions management provides the capability to centrally manage compliance related to air pollutant, water, and wastewater emissions and/or manage the GHG emissions at the organization level. Figure 4.3 shows the emissions management process.

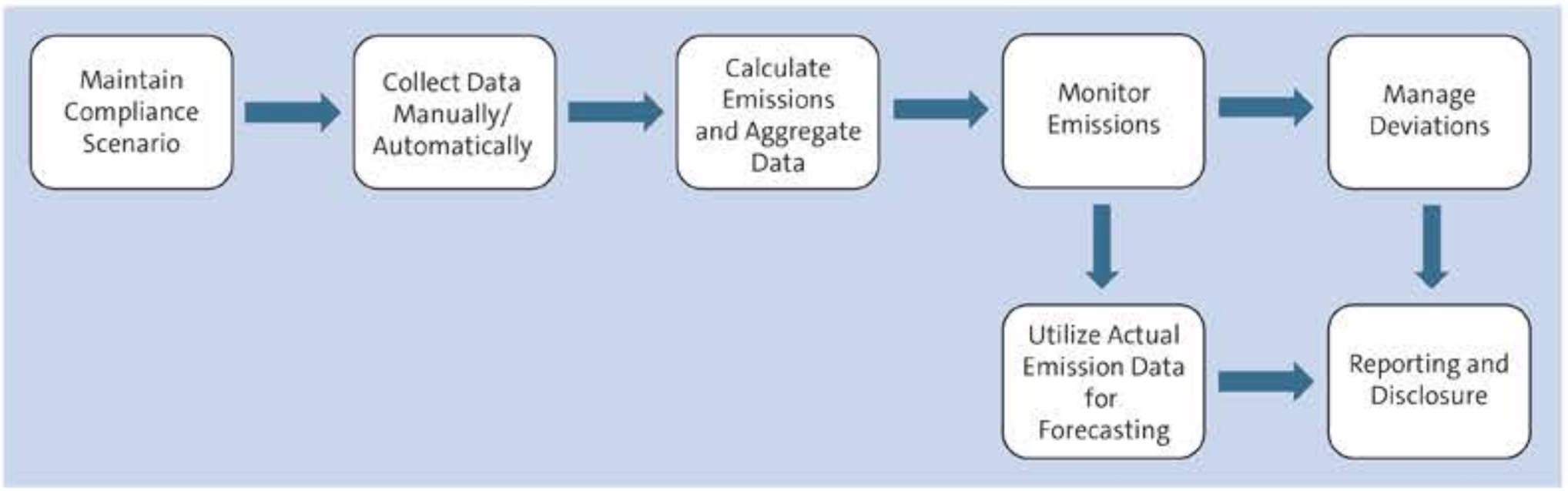


Figure 4.3 Process Steps for Data Collection, Calculation, and Monitoring of Emissions

In the earlier section, we introduced the concept of compliance requirement, which is the foundation for driving the compliance management and emissions management process.

However, from an emissions management standpoint, we now introduce the compliance scenario object, which is the building block for emissions management and supports the execution of one or more compliance requirements for a uniquely identified emission point (the location object).

By definition, a *compliance scenario* is the repository of various activities driven by the compliance requirement for a unique emission point or operating asset. These activities may include data collections, samplings, equations, location aggregations, and tasks. Once the compliance scenario is defined, consumption or activity data such as amount of natural gas used can be collected manually from an end user through data collection tasks or manual upload of data using spreadsheets. Additionally, external data sources such as data historians can be connected to SAP EHS emissions management application to automatically collect data. This data is consumed by the equations maintained within the compliance scenario to provide the calculated emissions which can also be aggregated by location. Figure 4.4 shows the structure of the equations and all variables related to them, all of which can be configured and edited without any custom programming.

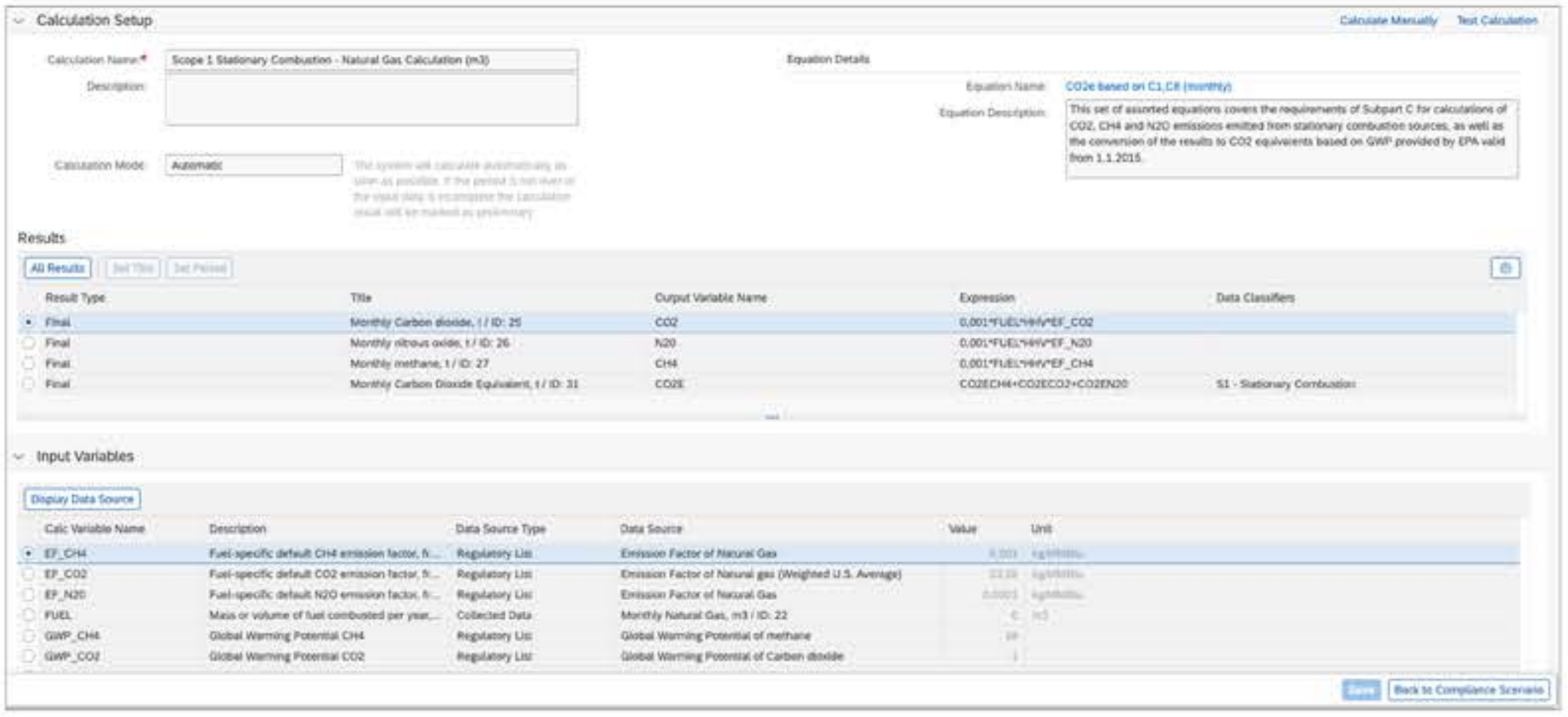


Figure 4.4 The Calculation Setup Screen Contains Equations and Associated Variables

If limit checks are maintained for any specific pollutant within the compliance requirement, the application performs a limit check automatically and compares the emission to the limits. In case of exceedances, deviation records can be created, and investigated. Corrective actions can be set up and tracked for completion as part of the task management. The application allows for monitoring of the emissions and utilizing the emissions data for forecasting and regulatory or voluntary reporting.

> **Note**
>
> *Emissions management* provides the capability to perform scope 1, 2, and 3 calculations at the corporate level based on commonly followed standards such as the GHG protocol and others. This is based on the same calculation functionality (equations, factors, limits, and collection functions) as is used for air pollutants and water effluent tracking.

4.3 Waste Management

Waste management provides the capability for cradle-to-grave tracking of hazardous waste. As discussed earlier with compliance management, compliance requirements are the building blocks of the waste management application as well. The compliance requirement is the repository for managing regulations pertaining to waste and the associated regulatory lists, as well as the waste permits that may have been issued to a company. For a legally compliant waste management process, it is essential to have the associated regulations and permits maintained appropriately and is therefore the

starting point for the waste management process. The overall process for waste management is shown in Figure 4.5.

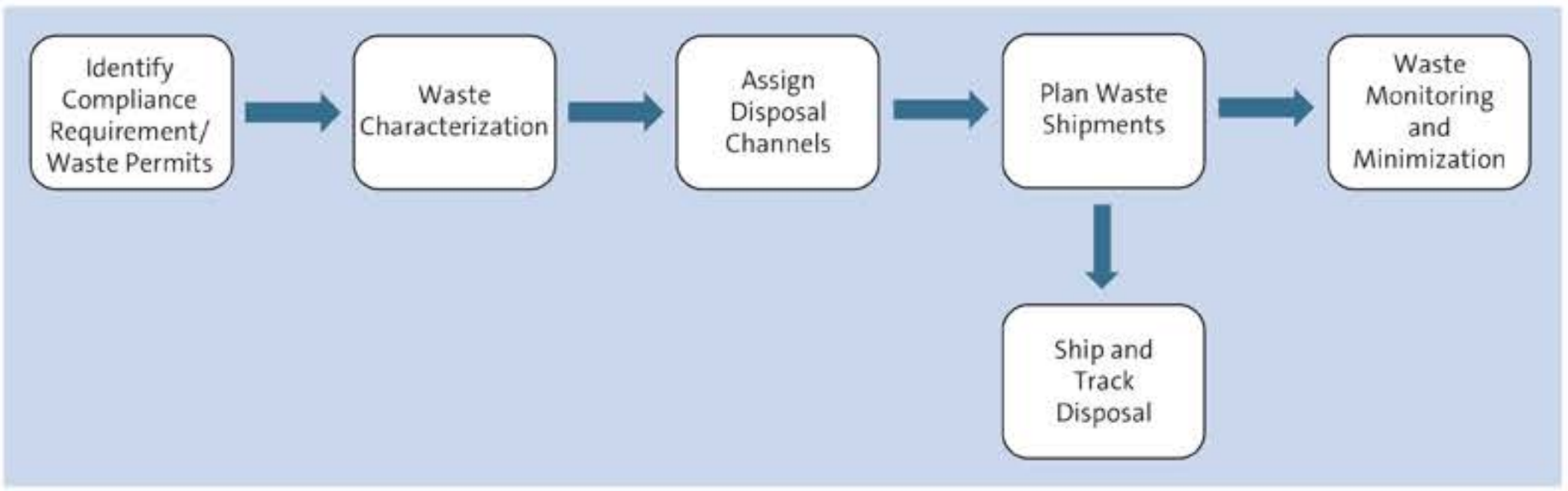


Figure 4.5 Process Steps for Tracking Waste Generation and Shipments

Once the compliance requirements are in place, the waste can then be characterized by assigning the waste codes from the regulatory lists along with the identification of analytical composition, physical-chemical properties, and any other characteristics pertinent to the waste being generated. Waste stream identification allows for identifying the point(s) of generation of the waste, tracking the waste to storage, and eventually to the appropriate disposal channels.

The disposal channel identifies the appropriate transporter, disposer and approved quantities of waste that can be disposed through that channel. Transporters and disposers are assigned at the waste material level but waste streams, including disposal channels are created at the level of the products assigned to the waste material. Upon identification of the appropriate disposal channel, waste shipments can be planned and shipment documents such as the waste manifests can be generated from the application.

4.4 Data Model Description

As there are a relatively large number of data objects and object relationships that drive functionality in the SAP EHS Management, environment management product, it is important to understand what they are. Table 4.1 contains a list of the most important objects for the various processes.

Main Objects	Description
Location	Central hierarchy object shared by SAP EHS Management, incident management, SAP EHS Management, health and safety management, and SAP EHS Management, environment management that anchors all of the processes. In the case of SAP EHS Management, environment management, compliance requirements, emission calculations, and waste generation can all be tracked back to a location. The hierarchy can be set up to emulate an entire enterprise from corporate level down to specific equipment, and can either be set up standalone, or integrated with other hierarchies in SAP like functional locations and equipment masters.
Compliance Requirement	Building block for compliance, emission, and waste management processes. SAP EHS Management, environment management object to maintain regulations, permit requirements or internal policies. Maintains the requirements in hierarchical structure. All the limits, regulatory lists, equations, and tasks relevant for the requirement are maintained.
Compliance Scenario	The central object for emissions management that utilizes compliance requirement and the EHS location object to manage various activities relevant for emission management process
Consumption/Activity	Transactional record that tracks required information over time for certain variables in the calculation equations. A good example is consumption of natural gas, which can be input for an equation to derive GHG emissions.
Calculation	Grouping of equations and associated variables that are used to execute the actual mathematical calculations and generate results.
Deviation	A deviation is an event that results in a non-compliance with a regulation, permit requirement, or an internal company policy.
Waste Generator	Entity or location that is designated physically and legally as the generator of a waste, and bears the responsibility of the cradle-to-grave or cradle-to-cradle tracking of that waste.
Waste Stream	Waste stream defines the relationship between a waste product, a waste generator, a storage location for the waste, and the points of waste generation.
Disposal Channel	Disposal channel is a mechanism to ensure that the waste is transported and disposed of only by approved transporters and disposers.

Table 4.1 List of Primary Data Objects within SAP EHS Management, Environment Management

5 Management of Change

In all industries, in all companies, change is occurring at all times. Changes are made to reduce cost, be more efficient, fix a problem, carry out new strategic decisions, protect workers, and for many other reasons. There is organizational change, process change, procedural change, physical change. The companies that can manage change effectively increase chances of higher profitability, lower operational costs, a strong brand, and motivated workers. The reason is that change creates risk. Managing change of any kind is essentially managing risk.

With this as the backdrop, SAP developed the SAP Management of Change application in roughly the same timeframe as SAP EHS Management, incident management and SAP EHS Management, health and safety management. SAP Management of Change version 1.0 was a "networked application" capable of being implemented as a standalone and interfaced to SAP ERP systems. Similar to the other applications in the SAP EHS Management portfolio, it was migrated to the SAP S/4HANA platform and is currently available on-premise, in a hosted private cloud, or in a multi-tenant public cloud.

Note

SAP Management of Change shouldn't be confused with the engineering change management functionality that is part of the SAP Product Lifecycle Management solution area. That engineering change management application is more focused on product-related changes.

While technically capable of being configured to handle any type of change, the primary objective of the SAP Management of Change application is to track operational changes such as procedures, equipment changes, software changes, or even things like worker training. For heavy industries like chemical and oil and gas, the focus and management of these types of changes is an important component of their process for safety discipline and initiatives. Many industrial accidents have been caused in part by certain changes made that weren't fully communicated, reviewed, and implemented correctly. SAP Management of Change helps to prevent that from happening. It's a relatively simple application that drives the lifecycle of a change from initial request to executing the activities to affect the change, as described in the subsequent sections.

The purpose of this section is to summarize both the business process and functionality that is offered within SAP Management of Change. To do this, we'll describe each major step in the process and list key features along the way. At the end, we'll discuss outputs from the process such as regulatory reports and analytics.

5.1 Business Process

SAP Management of Change enables a process for tracking changes where an initial change request is submitted by a user who is authorized to do so, then routed to the appropriate review or approver personnel based on configurable business rules, and if approved, define and monitor the specific activities required to complete the change correctly. See Figure 5.1 for the main business process steps.

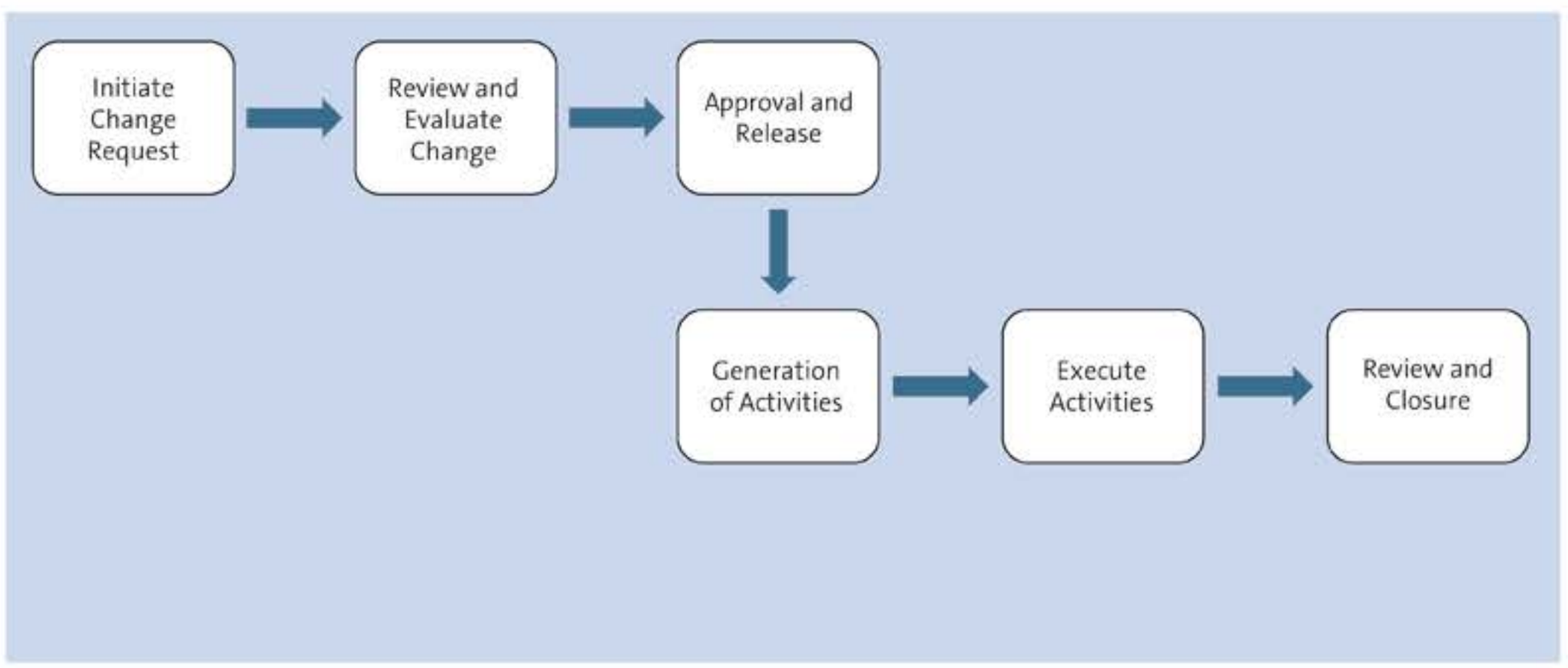


Figure 5.1 Lifecycle of a Change Request in SAP Management of Change

In the following sections, we'll cover each of these steps, including initiating the change request, reviewing and evaluating changes, approving changes, executing activities, and reviewing and reporting analytics, in more detail.

Initiate Change Request

Similar to SAP EHS Management, incident management, there is a dedicated application to handle the initial entry of a change request. A primary reason for this is the fact that the user audience who may be authorized and expected to create change requests could be much broader than the power users who are driving the rest of the SAP Management of Change process. Operations personnel, maintenance, field workers, facility engineers, process engineers, EHS managers, and others all could be enabled to request operational changes. The **Change Request 'Complex Change': New** screen (Figure 5.2) is meant to be relatively simple and capture the required information to be sent through SAP Workflow to the personnel charged with tracking and reviewing requests. Information such as relevant location or equipment, urgency, criticality, requested dates, and impact assessment are captured in the change request.

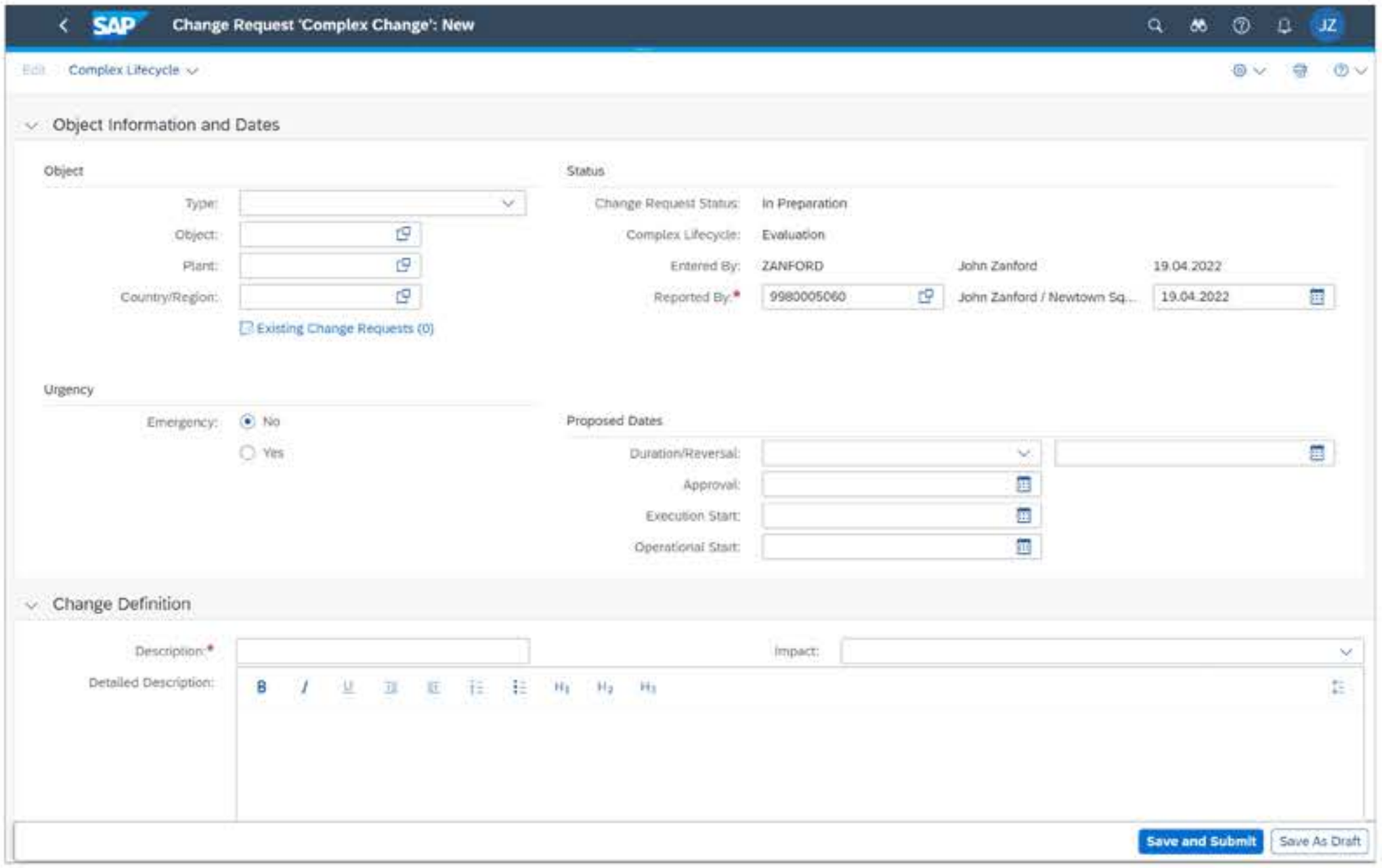


Figure 5.2 Initial Change Request Screen

Review and Evaluate Change

If you are designated as a reviewer for SAP Management of Change change requests, you'll receive an email notification along with new entries in the SAP Management of Change **Work List** to conduct a particular review or evaluation process. The logic determining who receives the request is based on authorization and also on an SAP function called Business Rules Framework plus (BRFplus), which allows the user to configure certain conditions to route the request to the appropriate personnel. Information included in the initial request record is viewable to the reviewer(s) and if not sufficient to make a decision, the reviewer can always return the change request to the requester for more information.

Approve Change

Once all the reviews are completed, the application can be set up to automatically start the approval process. If each reviewer indicates an approval in the system, the list of activities needed to affect the change can be finalized and task assignments made. Each reviewer has the option to approve or reject the change and drive an iterative process of requesting more information, adding additional reviewers and review criteria, documenting the decisions, and recording the rationale.

Execute Activities

The approval steps themselves are managed as activities in SAP Management of Change, and once a change is approved, all activities relevant for making the change and closing out the change request process can be added, imported, or generated automatically by the system based on configurable rules. This list of activities is presented in a hierarchical format with the expected data for whose responsible, due dates, status, and categorization (see Figure 5.3).

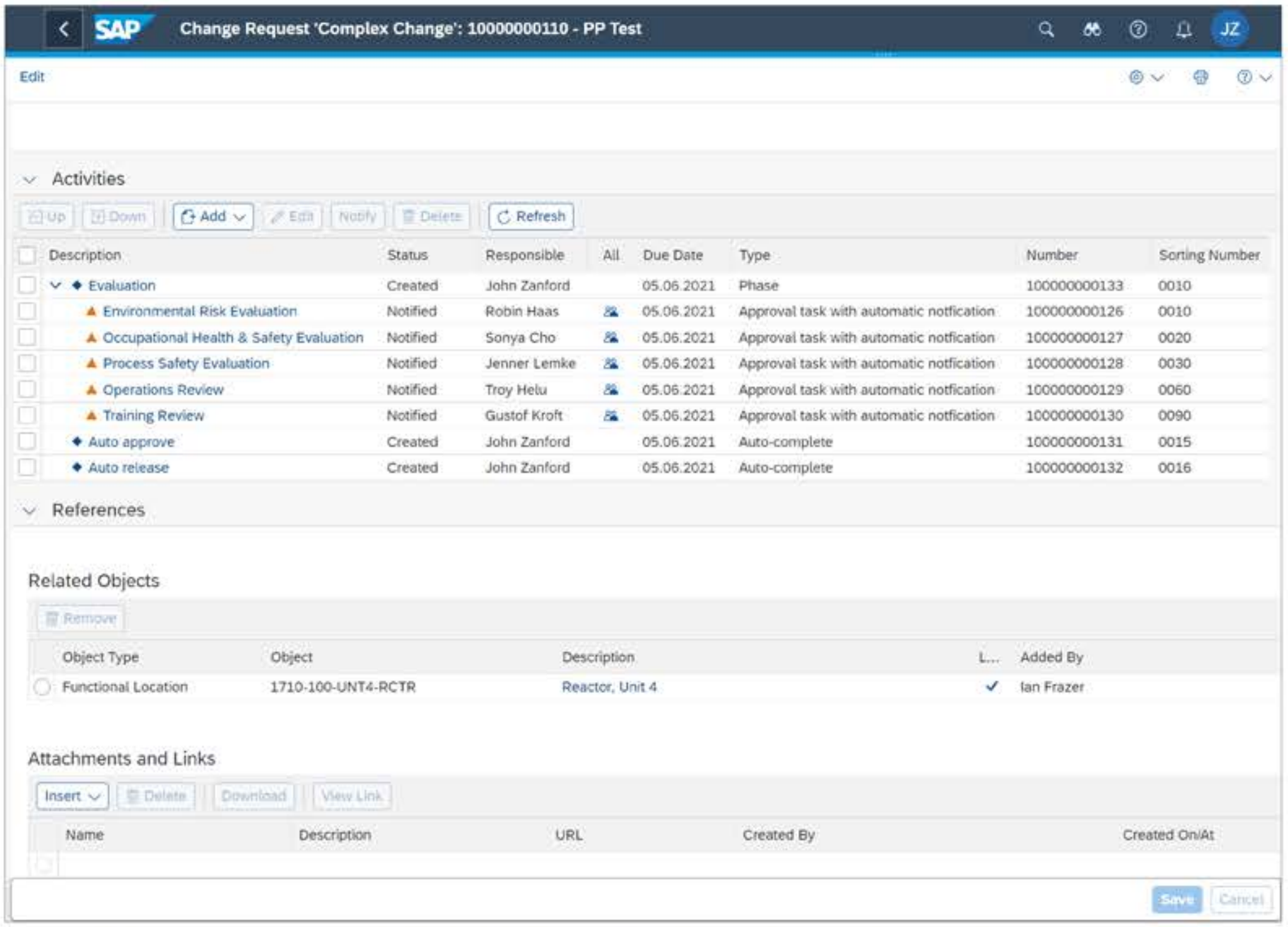


Figure 5.3 Hierarchy of Activities to be Performed Related to a Change Request

Those responsible for completing an activity will get workflow reminders and email notifications and or can check their SAP Management of Change **Worklist**. These users can input information and update status. Since the order in which activities are completed can be very important depending on the nature of the change, the system can ensure this by triggering notifications for activities once prerequisite activities are showing as **Complete** in the system.

Analytics

In the original SAP Management of Change version 1.0 application, there were very limited reporting and analytical capabilities included. There were basic graphical chart views of change requests and activities, with reports built on OData extracts.

In the current SAP S/4HANA on-premise and cloud releases of SAP Management of Change, much more capable views utilizing the embedded analytics tools are available with the standard application. These include SAP Fiori and APF. There is a SAP Fiori view placing multiple small charts with key information such as the breakdown of change request types and impacts of the changes. This is followed by one larger chart that is the focus of the view. In Figure 5.4, the focus is on change request status. Two reporting views using APF include change activities over time and a breakdown of changes based on who is entering them (see Figure 5.4).

Figure 5.4 Top Half of an SAP Management of Change Dashboard that has Graphical Views

5.2 Data Model Description

Table 5.1 describes the main objects in the SAP Management of Change process.

Object	Description
Change Request	The overall primary record which is created in the initial step and contains all necessary data for approvals, integration points, document attachments, status, and activities.
Activity	Task object to drive process of reviewing and then actually affecting and completing the change.
Leading Object	The available integration objects outside of SAP Management of Change that can drive the change. Examples are functional locations, equipment, and plants.

Table 5.1 List of Primary Objects within SAP Management of Change

Object	Description
Person	Linkage to valid person records or SAP business partner records denoting who is involved in the change request.

Table 5.1 List of Primary Objects within SAP Management of Change (Cont.)

6 Maintenance Safety/Permit to Work

The process and functionality related to the Permit to Work applications is not necessarily a true SAP EHS application in that it all resides in the overarching Plant Maintenance modules of SAP. The primary objective of the solution is control hazardous work while reducing the cost of maintenance and to leverage an integrated process between SAP Asset Performance Management and EHS to communicate pertinent safety risks and control the maintenance work being performed. Risk and safety information from SAP EHS can be utilized in the permit process.

The Permit to Work function helps ensure all safety precautions for the maintenance teams have been identified, communicated, and put in place. It contains steps for the planning, execution, and approval process for different types of work permits and safety certificates.

Note

Even though key functionality for this process is provided through the SAP S/4HANA enterprise management, a specific license purchase for SAP Work Clearance Management is needed to enable a complete work permitting process as described in this section.

The purpose of this section is to summarize both the business processes and functionality that is offered within SAP Plant Maintenance and SAP Work Clearance Management. To do this, we'll describe key steps in each process and list key features along the way. At the end, we'll discuss outputs from the process, such as regulatory reports and analytics.

6.1 Business Process

The business process enabled by the application starts with the application for the work permit and an approval step if appropriate. If approved, communication of required safety precautions and controls is made by applying them to the permit records. If all checks out, the work permit is activated and work is performed. Once complete, any safety precautions are removed (see Figure 6.1).

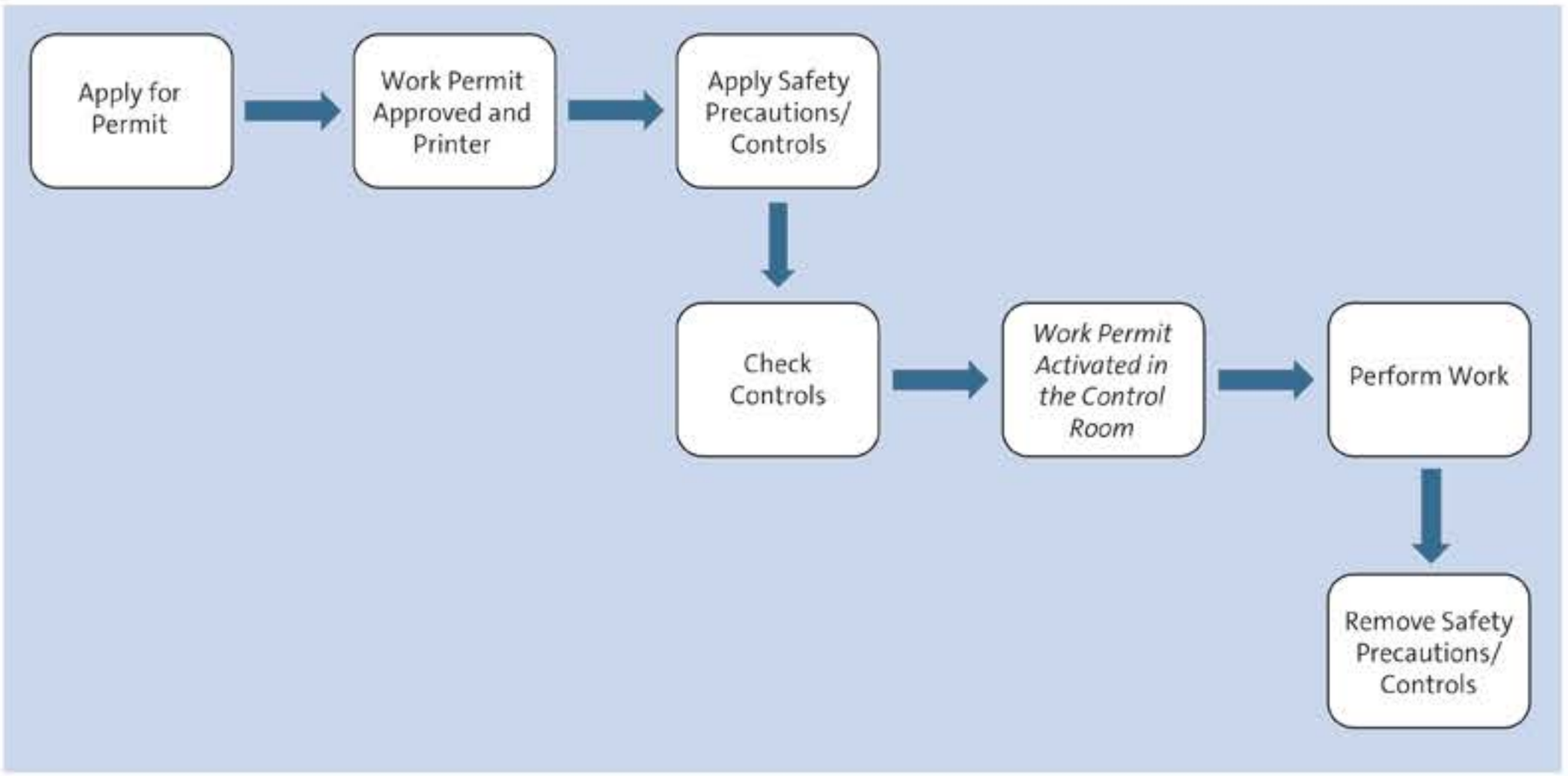


Figure 6.1 Process Flow for Control of Work in SAP Plant Maintenance

In the following sections, we'll cover these steps in more detail.

Apply for Permit

Once a maintenance order has been entered into the system, there is a chance to "control" the work by requiring a work permit to be approved. All necessary information, such as the points for isolation, the work to be done, who should approve it, and the validity date for the permit, are set in the **Permits** tab of the **Display Maintenance order** screen. Relevant safety information and instructions are documented on the **Safety Plan** tab of the order (see Figure 6.2).

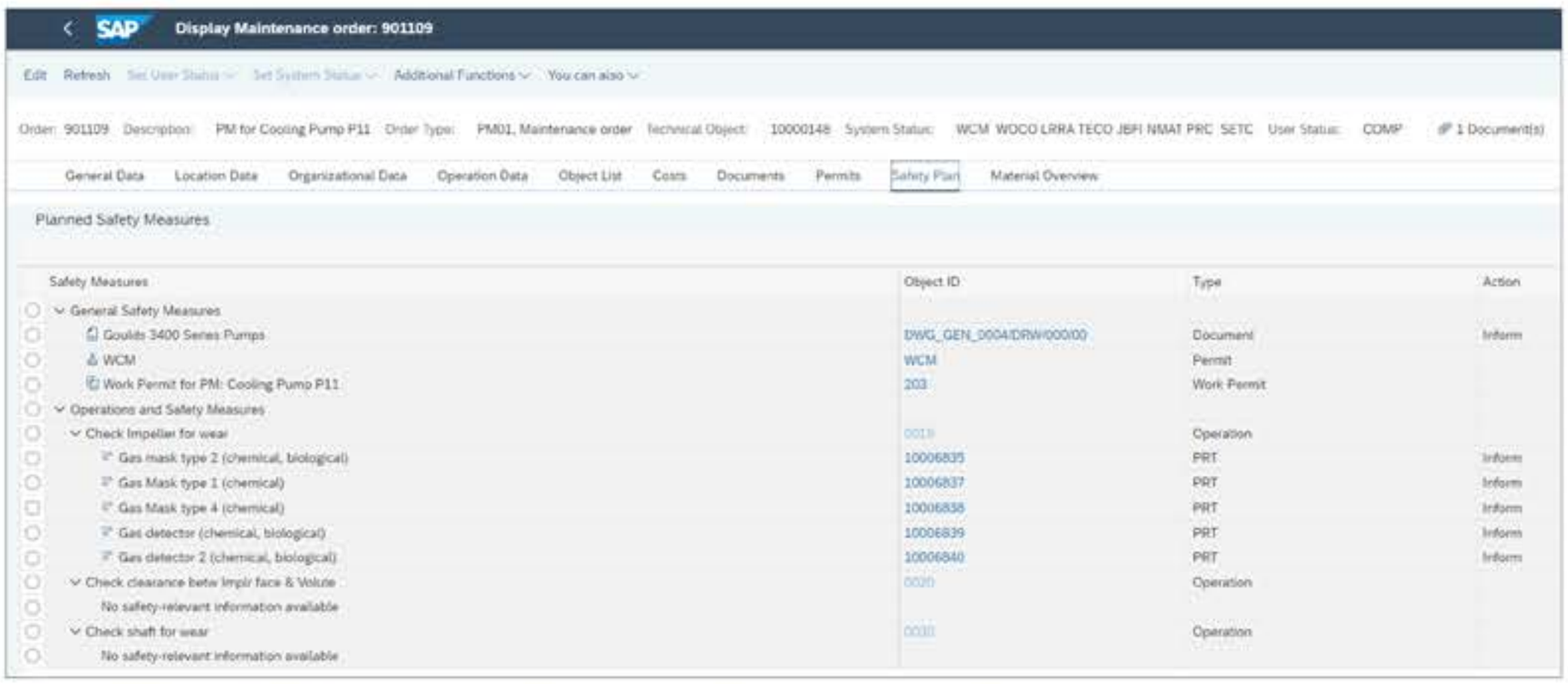


Figure 6.2 List of Safety Measures Relevant to the Maintenance Order

Work Permit Approved and Printed

Workflows are triggered and notifications sent to all those who were listed as approvers for the permit. The approvers are able to mark their decision via the workflow screen or manually in the SAP Work Clearance Management application, as shown in Figure 6.3. If all have approved, you are able to print the **Safety Certificate**.

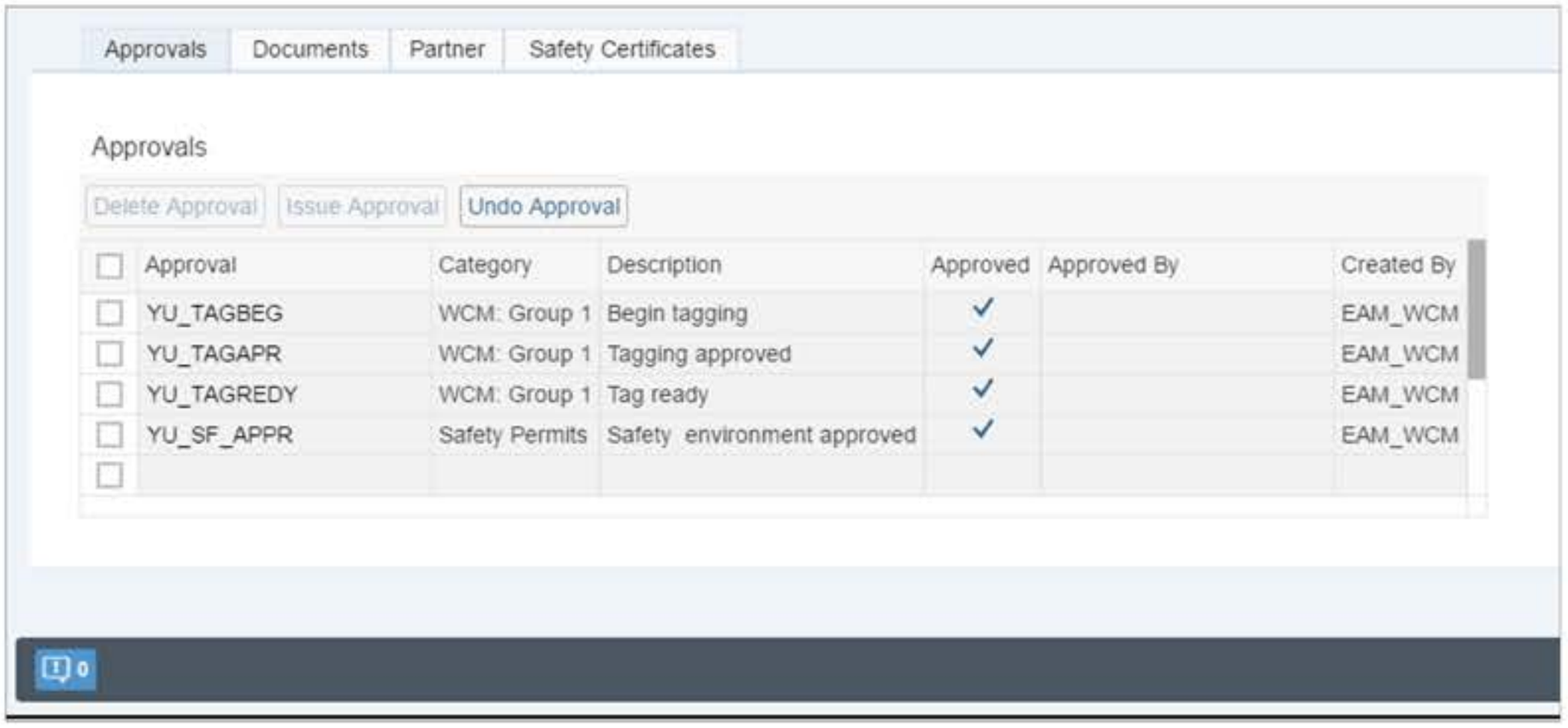


Figure 6.3 List of Independent Approvals for a Work Permit

Work Permit Activated in Control Room

Once approved, the overall maintenance order is released for scheduling or execution. This done by setting the **System Status** on the order to **Released**. A **Safety Certificate** can be set up and the process of isolating and physically tagging the equipment or location can occur. After successful isolation of the equipment, the maintenance worker receives the work order in their job card. Execution of the work can now commence.

Perform Work and Remove Safety Precautions

The worker(s) perform the planned and permitted work based on all conditions set in the order and the associated permits. The permit is returned and closed in the system. As a result, the system automatically recognizes that lockout/tag out is no longer requires and the lockout/tag out on site can be removed.

Note

There is a software development kit (SDK) included in the SAP Work Clearance Management product that allows you to build and provision a mobile app to drive some of the process steps that could be done out in the field.

6.2 Data Model Description

While there are workflows available to move the process forward, the Permit to Work process is primarily driven by a few key objects, the information they capture, and their status. Table 6.1 below contains these objects and a brief description.

Main Objects	Description
Maintenance Order	The overarching process or object that triggers the need for work permitting and control of work. The maintenance order object is standard with SAP S/4HANA enterprise management.
Work Permit	The embodiment of a work clearance application or request to work. Permits can be set up and released to allow work to occur once required conditions are met, and can also be closed to stop work. The main information related to the permit is contained in the **Permits** tab on the **Maintenance Order** screen.
Isolation	Both a system setting and analogous to the physical lockout or tagout devices.
Work Approval	A child record for the work clearance application that designates all approvals needed, and the final disposition of those approvals.
Safety Certificate	The Safety Certificate is used for the lockout or tagout of equipment and other technical objects and for other safety certificates like Excavation Certificate.

Table 6.1 Data Object definitions for Permitting and Work Clearance Management

7 Deployment at a Glance

This E-Bite was intended to provide a functional overview of the applications comprising the SAP EHS Management portfolio, and not as a configuration guide or technical manual. However, to provide some context on the ways in which companies can consume and implement the functionality, this section is dedicated to explaining general deployment.

The purpose of this section is to list options for purchasing and deploying the software, along with architecture and configuration information, and sources of information for further resources on deployment.

7.1 Deployment Options

SAP EHS Management is available to be deployed in multiple ways. The options have expanded in parallel to the evolution of the SAP platforms and market trends. In recent years, customers have shown strong demand for applications installed and delivered through the cloud. SAP has responded and most of what is offered by SAP can be implemented from the cloud. SAP EHS Management was first built as an on-premise application in the SAP ERP environment, then moved to SAP S/4HANA on-premise. At that point, effort was made to offer EHS functionality in a single-tenant, private cloud subscription. Finally, in the past two years, SAP EHS Management applications are offered in a multi-tenant, public cloud deployment model. Both private and public cloud options require a minimum purchase of SAP S/4HANA Cloud to run it.

On-premise applications are planned with one major release a year, which is part of the SAP S/4HANA on-premise development path. Cloud-based applications have a more frequent release schedule, which is currently on a quarterly basis, but this may move to a continuous delivery model in the future. Fundamentally, both the on-premise and cloud versions of SAP EHS Management applications run the same processes. Public cloud applications have a bit less configuration and custom development flexibility, although SAP has found a way to support extensibility in a multi-tenant environment.

Finally, there have been customer projects set up with a primary on-premise system for traditional ERP functions, and a need to have the latest functionality for SAP EHS Management implemented in a hybrid model; the EHS applications are delivered in the cloud, and then linked back to the on-premise instance through various function calls and APIs. This approach can technically work, but it is not considered standard, as some project work is needed to activate and maintain remote function calls (RFCs) and modify reporting logic to handle the hybrid architecture.

Table 7.1 contains a summary of the standard options for SAP EHS Management.

Deployment Model	Products
■ On-Premise	■ SAP EHS Management component extension ■ SAP S/4HANA Asset Performance Management
■ Private Cloud ■ Single-Tenant	■ SAP ERP, private cloud edition ■ SAP S/4HANA Cloud, private edition ■ SAP S/4HANA Cloud, private edition, tailored option
■ Public Cloud ■ Multi-tenant	■ SAP S/4HANA Cloud

Table 7.1 Deployment Options for SAP EHS Management Functionality

7.2 Commercial Considerations

In the previous section, we introduced the on-premise and cloud deployment options for SAP EHS Management. There are commercial implications with the choice of deployment. Cloud applications are sold as a subscription model based on users in the system or on those whose data is being processed. On-premise applications are sold based on the total number of employees within the customer enterprise. On-premise SAP EHS Management will "live" within either the SAP ERP engine or SAP S/4HANA enterprise management. For cloud, there is a prerequisite of SAP S/4HANA Cloud with a minimum number of users for a standalone instance.

Ancillary solutions utilized by SAP EHS Management include SAP Adobe Interactive Forms and SAP Analytics Cloud. There are license purchases required for these tools, but they may be part of other license agreements with SAP.

SAP EHS Management does offer a set of dedicated mobile applications as described in earlier chapters. Depending on specific requirements and architecture at the customer site, certain components of the SAP Business Technology Platform (SAP BTP) may be required.

7.3 Installation

In this section, some key steps to activate and use the EHS functionality within SAP S/4HANA. This isn't a complete list. Refer to installation instructions and notes published by SAP for more details.

Activation

As discussed in Section 1, SAP EHS Management product is now part of the SAP S/4HANA core, which means that SAP EHS Management applications are installed with the SAP S/4HANA application server systems. However, there are some additional follow-up activities that need to be performed to install the SAP EHS Management applications described in this E-Bite.

Additional setup activities for SAP EHS Management include the following steps:

1. In Transaction SICF, activate all EHFND*, EHENV*, and EHHSS* Web Dynpro services below the node /default_host/sap/bc/webdynpro/sap/.
2. Activate the SAPUI5 application handler.
3. Copy the delivery customizing from client 000 into your other clients.
4. Make the relevant settings in the Customizing activities.
5. Review SAP Note 3127655 and run report R_EHFND_CHEM_PROP_MIGRATION to migrate chemical properties.

Additional setup activities for SAP Management of Change include the following steps:

1. In Transaction SICF, activate the following Web Dynpro services below the node /default_host/sap/bc/webdynpro/moc/:
   - WDA_ACTIVITY
   - WDA_ACTIVITY_CHANGE_LOG
   - WDA_CHANGE_REQUEST
   - WDA_CHGREQ_CHANGE_LOG
2. Activate the following services:
   - NWBC runtime node
   - SAPUI5 application handler
3. Copy the delivery customizing from client 000 into your other clients.
4. Make the relevant settings in the customizing activities.
5. Consider using the example customizing delivered with the hierarchical BC set /MOC/EXAMPLE_CUSTOMIZING.

Security

SAP EHS Management applications are delivered with detailed authorization concept that forms the backbone of all SAP applications. The security is role-based. SAP EHS Management applications are delivered with standard end user roles. The standard end user roles are provided without any authorizations assigned to them. These roles can be adjusted by assigning authorization objects to them in the system. In addition to the standard roles, a master role (SAP_EHSM_MASTER) is provided that contains the complete content of the EHS applications. Table 7.2 contains the list of the roles delivered with SAP EHS Management applications. Figure 7.1 provides an example role list as well. For exact details, refer to the information on the SAP Help Portal.

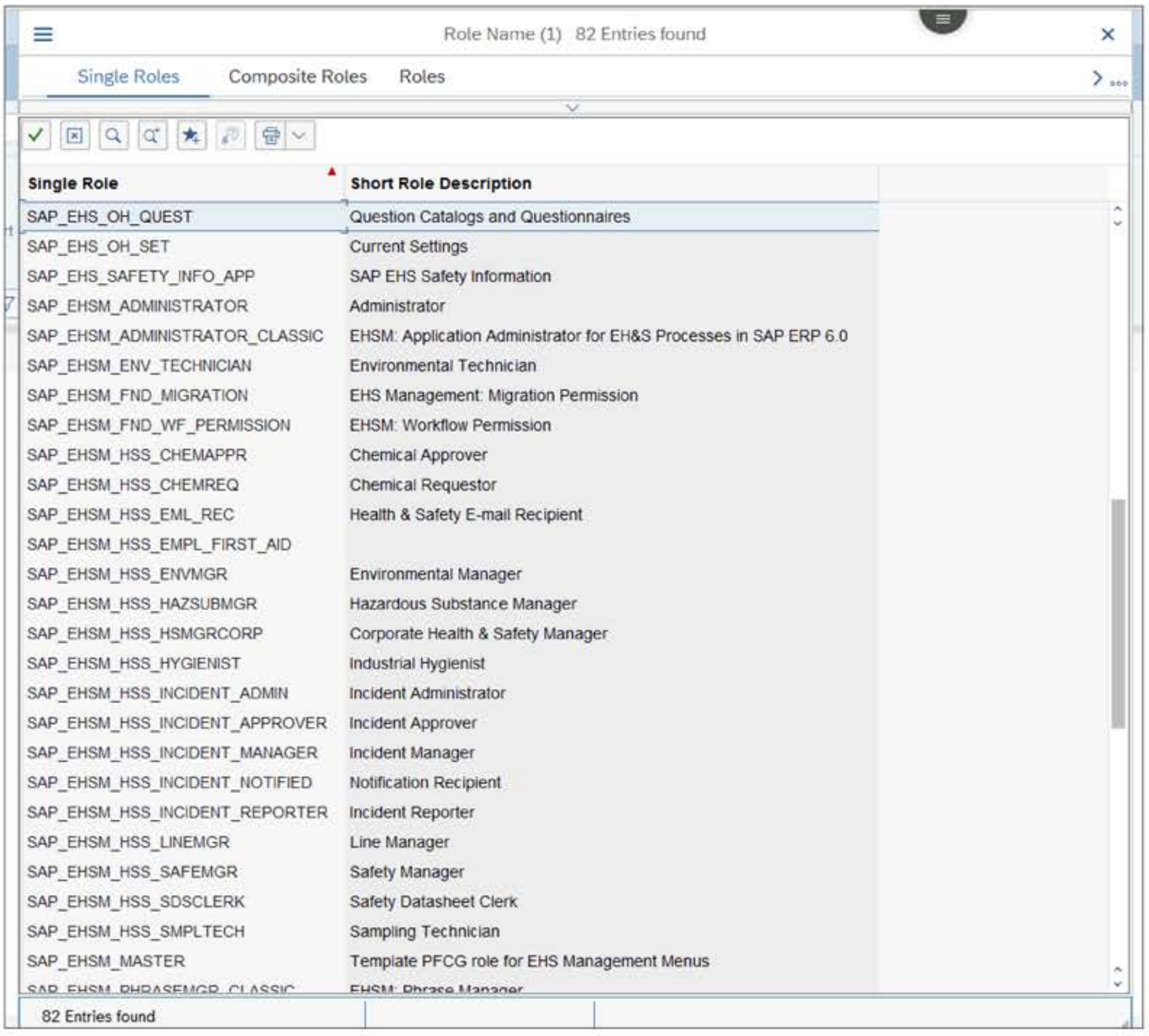


Figure 7.1 Example List of Roles

Frontend Role	Role Description
Employee - First Aid	Employees providing medical assistance to sick/injured employees.
Environmental Manager	Assigned to the person managing the compliance activities as well as emission monitoring to meet the requirements of federal/state/local regulations.
Hazardous Materials Manager	Assigned to employees responsible for managing hazardous materials in a company.
Industrial Hygienist	Assigned to employees responsible for exposure monitoring, risk monitoring, and ensuring the health & safety of the employees.
Production Operator - EHS Info	Assigned to employees responsible for environmental tasks.
Backend Role	**Role Description**
Chemical Approver	Assigned to employees responsible for approval of any new chemicals in a plant.
Chemical Requestor	Assigned to employees who may request purchase of a new chemical.
Corporate Health and Safety Manager	Assigned to employees who are overall responsible for health and safety of the employees within the organization.
Employee - First Aid	Employees providing medical assistance to sick/injured employees.
Environmental Manager	Assigned to person managing the compliance activities as well as emission monitoring to meet the requirements of federal/state/local regulations.
Hazardous Substance Manager	Assigned to employees responsible for managing hazardous materials in a company.
Incident Manager	Assigned to individuals who are responsible for managing an incident/near miss/safety observation and track completion of investigations and corrective actions.
Incident Reporter	Assigned to person who would be reporting an incident/near miss/safety observation.
Industrial Hygienist	Assigned to employees responsible for exposure monitoring, risk monitoring, and ensuring the health and safety of the employees.
Notification Recipient	Assigned to recipients of fatality notification.

Table 7.2 All Standard User Roles Provided by SAP EHS Management

Backend Role	Role Description
Safety Data Sheet Clerk	Assigned to employees responsible for entering the SDS data in SAP for an incoming chemical .
Safety Manager	Assigned to employees who are solely responsible for the safety of the employees.
Sampling Technician	Assigned to employees who are responsible for planning, preparing, and executing samplings.
Production Operator - EHS Info	Assigned to employees responsible for environmental tasks.

Table 7.2 All Standard User Roles Provided by SAP EHS Management (Cont.)

7.4 Migration

As discussed in Section 1, functionalities for EHS within the SAP platform have evolved over time since the late 1990s. As a result, many companies still run the SAP EHS Management component extension while others have moved on to SAP S/4HANA. Therefore, it's important to understand the approach for either moving from the EHSM component extension to SAP S/4HANA or upgrading from a lower version of SAP S/4HANA to the latest version.

One of the important steps in migration is moving existing data and SAP has provided the SAP S/4HANA migration cockpit as one technical option. Using the SAP S/4HANA migration cockpit, system admins can migrate data directly from certain SAP source systems or can use staging tables to migrate data using appropriate migration Microsoft Excel templates.

Some of the key features of SAP S/4HANA migration cockpit include:

- Migration of data using migration projects
- Monitoring of migration status
- Selection of migration objects relevant to migration scenario
- Capability to simulate migration prior to actual migration of data to SAP S/4HANA

Note

There is no direct path for conversion from the EH&S add-on in SAP R/3 to SAP S/4HANA.

Below is the list of all migration objects available for SAP EHS applications (Table 7.3).

Migration Object Name	Object Type	Approach	Component
EHS - Task	Transactional data	File/Staging Table	EHS-SUS-EM
EHS - Data classier	Master data	File/Staging Table	EHS-SUS-EM
EHS - Location classier	Master data	File/Staging Table	EHS-SUS-CI
EHS - Chemical/Physical property	Master data	File/Staging Table	EHS-SUS-FND
EHS - Compliance scenario	Master data	File/Staging Table	EHS-SUS-EM
EHS - Data collection	Master data	File/Staging Table	EHS-SUS-EM
EHS - Compliance requirement	Master data	File/Staging Table	EHS-SUS-CI
EHS - Calculation definition	Master data	File/Staging Table	EHS-SUS-EM
EHS - Location aggregation	Master data	File/Staging Table	EHS-SUS-EM
EHS - Location hierarchy	Master data	File/Staging Table	EHS-SUS-FND
EHS - Location	Master data	File/Staging Table	EHS-SUS-FND
EHS - Location hierarchy	Master data	Direct Transfer - – SAP ERP	EHS-SUS-FND
EHS - Location	Master data	Direct Transfer - – SAP ERP	EHS-SUS-FND

Table 7.3 The Primary Objects to be Migrated When Moving or Updating SAP EHS Management

In certain instances, SAP may deprecate some functionality as well or provide an alternative solution for old functionality. In addition, in certain cases, SAP may make changes to the data structure or data models of certain applications and prescribe specific steps and actions to be completed pre and post migration. All this information is readily available in simplification lists that SAP releases with every new release of the SAP S/4HANA version.

7.5 Basic Configuration and Master Data

This section contains information on some of the more important configurations and settings that impact the processes supported by SAP EHS Management solutions. It covers key user settings, backend configuration in the IMG, master data setup, etc. This section isn't intended to be a complete configuration guide.

SAP Fiori Launchpad Tiles

As discussed in Section 1, SAP EHS Management applications can be accessed through the SAP Fiori launchpad. The SAP Fiori launchpad is the entry point to SAP Fiori apps

on mobile or desktop devices. User access to the apps is based on SAP's authorization concept. SAP EHS Management is delivered with a pre-defined set of apps and tiles for each of the various solutions. Not all the apps delivered within SAP EHS Management solutions are native SAP Fiori applications; some of these have the structure of the Web Dynpro application. There are approximately 37 native SAP Fiori apps for the SAP EHS Management applications and details of these apps are available in the SAP Fiori apps reference library.

Configuration

SAP EHS Management applications can be easily configured using the IMG. The IMG is a tool which allows customers to configure and adjust the SAP application based on their specific requirements. The IMG tool is available for all SAP applications.

Figure 7.2 shows the IMG configuration structure for SAP EHS Management, incident management.

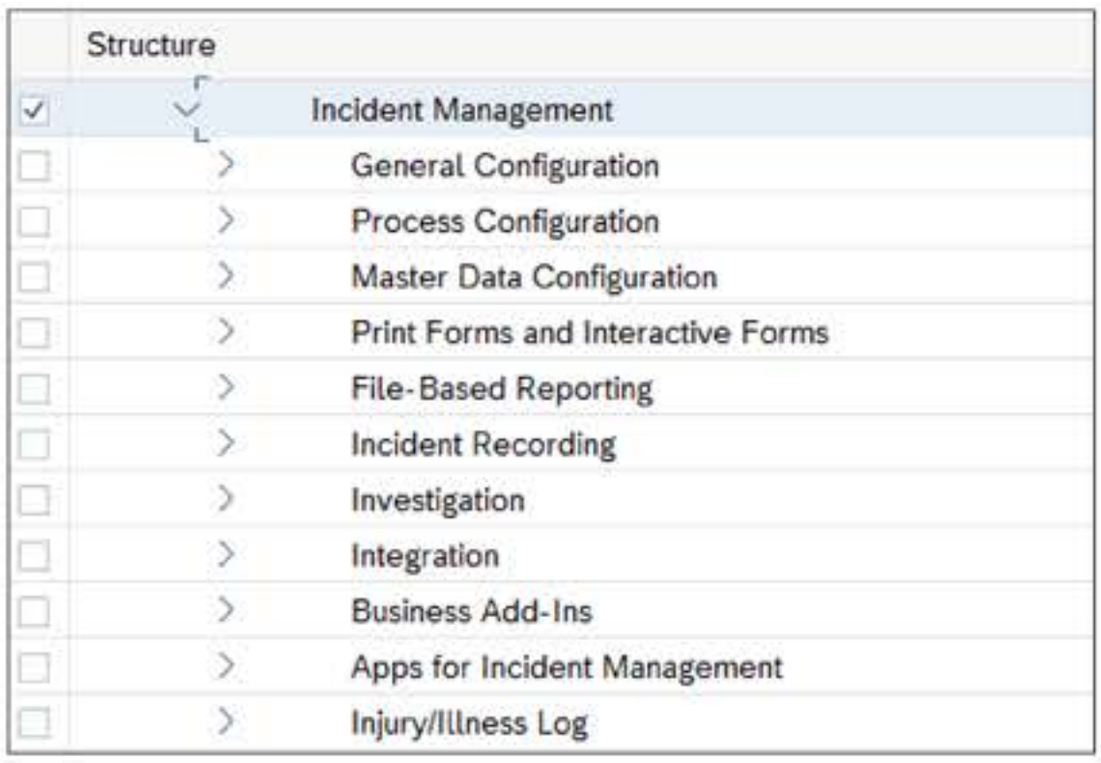


Figure 7.2 First-level View of IMG Structure for SAP EHS Management, Incident Management

Similarly, SAP EHS Management, health and safety management, SAP EHS Management, environment management, and SAP Management of Change solutions provide an implementation guide configuration structure that can similarly be adjusted based on customer specific requirements to set-up the system. The high-level structure of the IMG for each of the solutions are shown in the following figures:

- Figure 7.3 shows the IMG configuration structure for SAP EHS Management, health and safety management.
- Figure 7.4 shows the IMG configuration structure for SAP EHS Management, environment management.
- Figure 7.5 shows the IMG configuration structure for SAP Management of Change.

Structure
Health and Safety Management
General Configuration
Process Configuration
Master Data Configuration
Hazard and Control Register
Print Forms and Interactive Forms
Chemical Approval
Risk Identification
Risk Analysis
Risk Evaluation
Risk Treatment
Risk Monitoring and Review
Hazardous Substance Inventories
Safety Instruction
Integration
Fiori Apps for Health and Safety Management
Business Add-Ins

Figure 7.3 First-level View of IMG Structure for SAP EHS Management, Health and Safety Management

Structure
Environment Management
General Configuration
Process Configuration
Master Data Configuration
Compliance Requirement
File-Based Reporting
Integration
Business Add-Ins

Figure 7.4 First-level View of IMG Structure for SAP EHS Management, Environment Management

Structure
Management of Change
Settings for Reference Objects
Define Change Request Number Range Intervals
Define Activity Number Range Intervals
Define Timepoints
Define Codes
Define Catalogs and Code Groups
Define Duration
Define Partner Role
Define Impact
Define Follow-Up Actions
Define Activity Type
Define Activity Template
Define Change Request Type
User Status
Digital Signature
Business Add-Ins
Additional Settings
Tools

Figure 7.5 First-level View of IMG Structure for SAP Management of Change

Master Data

SAP defines *master data* as the core data of an enterprise that exists independently of specific business transactions and is referenced in business transactions. Master data represents business objects rather than business transactions and is rarely changed over a period. Based on SAP's definition of master data, SAP EHS Management solutions have their own master data which forms the core foundation of these solutions. Some of the examples of master data within SAP EHS Management includes, but is not limited to, locations, chemicals, controls, compliance requirements, jobs, and similar exposure groups.

One of the main master data objects within SAP EHS Management, which is utilized across all the SAP EHS Management solutions, is location. *Location* is a central master data object that can be organized in a hierarchical structure to represent where a location exists spatially or functionally in a company. Some examples of location are a plant, equipment, and building.

Location master data allows for creation of an independent location structure specific to the needs of the EHS group to manage the EHS business processes utilizing the SAP EHS Management solutions. However, the location structure in SAP EHS Management can be integrated with the technical objects that exist in the Plant Maintenance component. Figure 7.6 depicts a sample location structure. Each location within this structure is an individual location master data object with pre-defined attributes.

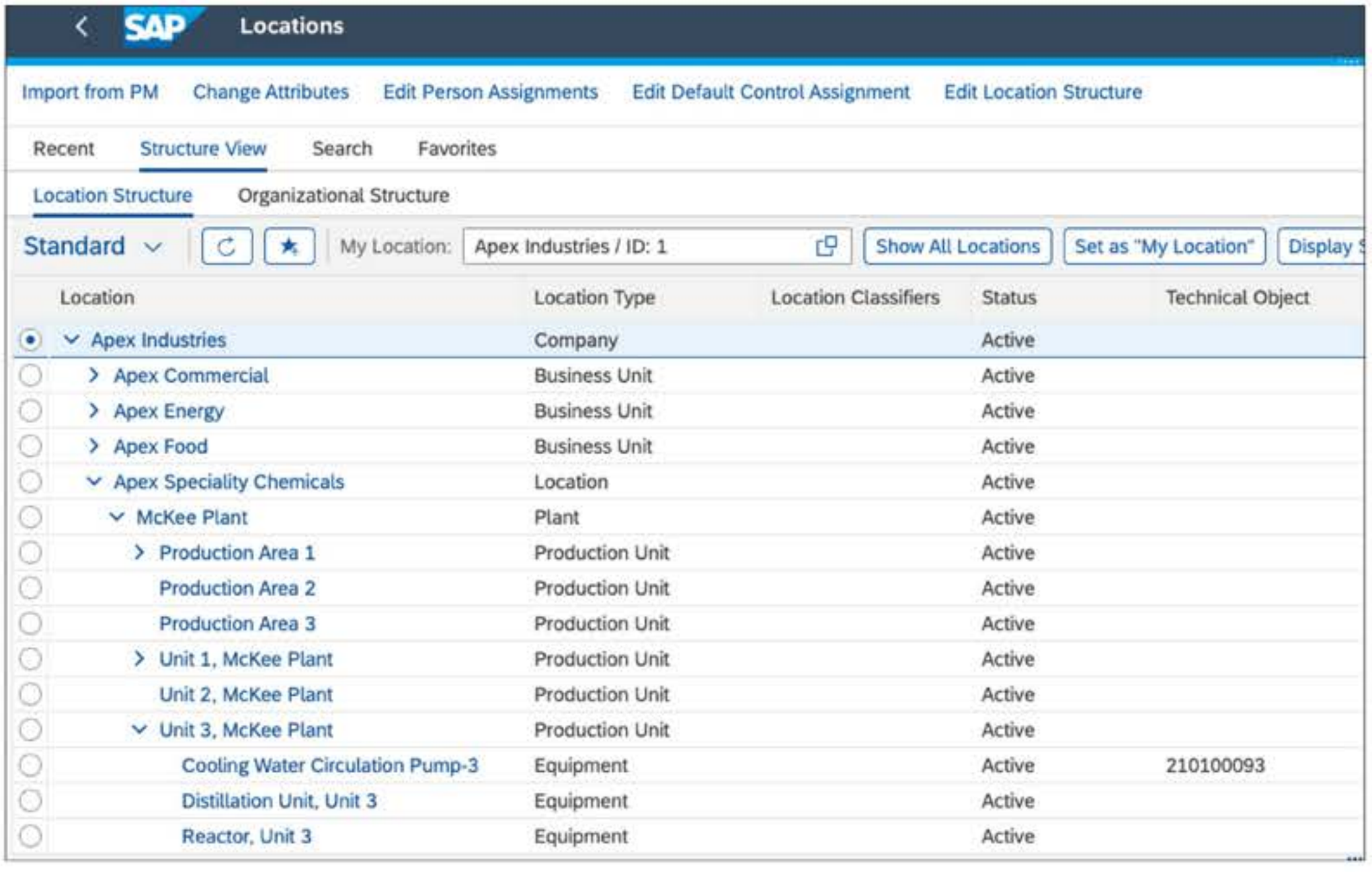


Figure 7.6 Demonstration Example of an EHS Location Hierarchy

Integration

SAP is an enterprise software and therefore it is important for various SAP applications to seamlessly integrate with each other, and SAP EHS Management is no different. This integration also ensures consistency by reusing existing data in different components and eliminate data redundancy. Table 7.4 lists the integrated components and specifies how these components can support a customer's business scenarios.

Component	Function
Business Partner	Leverage the business partner object in various process steps where a valid person record is required but it may not be an employee.
Personnel Administration	Leverage valid person records from either SAP ERP Human Capital Management or SAP SuccessFactors (depending on deployment). All of the SAP EHS Management solutions use this. Integration for various functions including task management and injury tracking.
Personnel Time Management	A two-way integration where absence data can be read from SAP HCM or absence records can be sent over from SAP EHS Management.
Organizational Management	Leverage organization structures for workflow notifications and other process steps.
Plant Maintenance	Leverage functional locations and equipment master records and also support the maintenance order process with a trigger from SAP EHS Management task management creation.
Cost Centers	Track financial impact against the central list of cost centers in SAP ERP.
Materials Management	Leverage material master records for chemical management integration.
SAP Manufacturing Integration and Intelligence and SAP Business Technology Platform	These are options to pull data from shop floor systems and data historians.
Regulatory Content	API available to import compliance requirement data based on regulations.

Table 7.4 Standard Integrations for SAP EHS Management

7.6 Useful Resources

Table 7.5 contains a list of information sources that may be helpful in better understanding SAP EHS Management functionality, roadmap, customer implementation approach, installation procedures, and other items to help move the application lifecycle forward.

Resource	Details/Links
SAP EHS Management product page	http://s-prs.co/v553604
SAP Road Maps	http://s-prs.co/v553603
SAP Help Portal EHS article	http://s-prs.co/v553605
SAP Fiori Apps Reference Library	http://s-prs.co/v553606
Useful SAP Notes	SAP Note 3127655
SAP Community Forums on sustainability	http://s-prs.co/v553607
User groups	ASUG, DSAG

Table 7.5 List of Informative Sites and Other Resources

8 What's Ahead for SAP EHS Management

In all of the other earlier sections in this E-Bite, we have talked about the evolution of the SAP EHS Management functionality in different versions, the current portfolio, and its value proposition. There are explanations of current processes, integration points, and deployment approach.

The purpose of this section is to provide you with a vision of what is possible with SAP EHS Management as part of the overall SAP S/4HANA platform and what is planned as a future state for the solutions, including our plan to incorporate intelligent technologies into the SAP EHS Management applications, more focus on the potential for IoT, and the role SAP EHS Management plays as a data source for sustainability reporting. We'll note which items are part of a planned development roadmap discussions versus more visionary concepts.

Note

This section is not intended to be an official development roadmap statement from SAP. For the current official roadmap of SAP EHS Management, access the SAP Road Maps site at http://s-prs.co/v553603.

8.1 An Intelligent Platform to Support Sustainable Operations

As a business function and domain area, the topic of EHS has, for decades, always been a key factor in maintaining business continuity and staying in compliance. In the last few years, there has been somewhat of a paradigm shift driven by many factors, most notably the increasing urgency and focus on creating more sustainable enterprise, and the onset of the global COVID-19 pandemic in 2020. Along with the traditional value proposition of EHS software described in Section 1, these new forces converged to create stronger demand for EHS information, more transparency, more automation, better data quality, new use cases— and new opportunity for EHS software vendors.

Significant opportunity comes with increased expectations, new requirements, and (a rather urgent) need for new innovations to address this current set of challenges facing EHS practitioners and their organizations.

With that as the backdrop, the teams responsible for SAP EHS solution management and development have been evaluating this new reality as it evolved and modified certain plans and priorities to account for it. The primary focus is to build out a unified but modular platform for EHS processes that leverages more "intelligent" technologies and elevates the solutions from simple transactional data systems to something more dynamic and useful. The objective is to have SAP EHS Management as a key driver for more sustainable operations, a main data source for all manner of sustainability metrics reporting, and a tool to help achieve true operational excellence.

The vision of how SAP EHS Management may be set up to do this can be initially broken down into the three themes or solution attributes of situational awareness, certain levels of autonomy, and ubiquity. Figure 8.1 shows these in no particular priority.

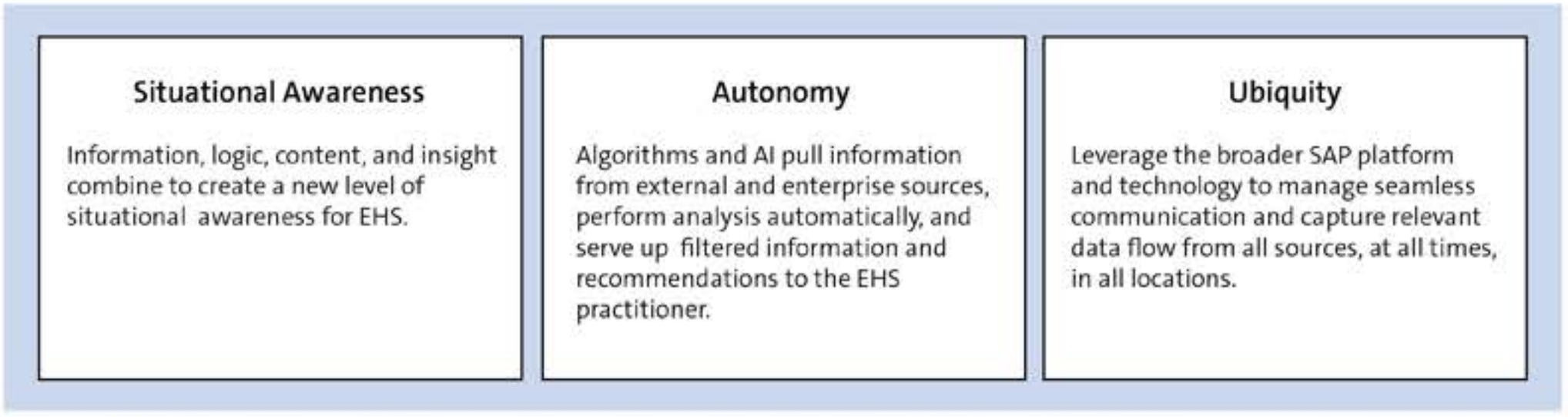


Figure 8.1 Three General Themes Governing a Possible Future for SAP EHS Management

These attributes give some structure to the overarching solution topics and intended customer business outcomes that SAP would like the EHS applications to foster and support. Figure 8.2 shows this general relationship:

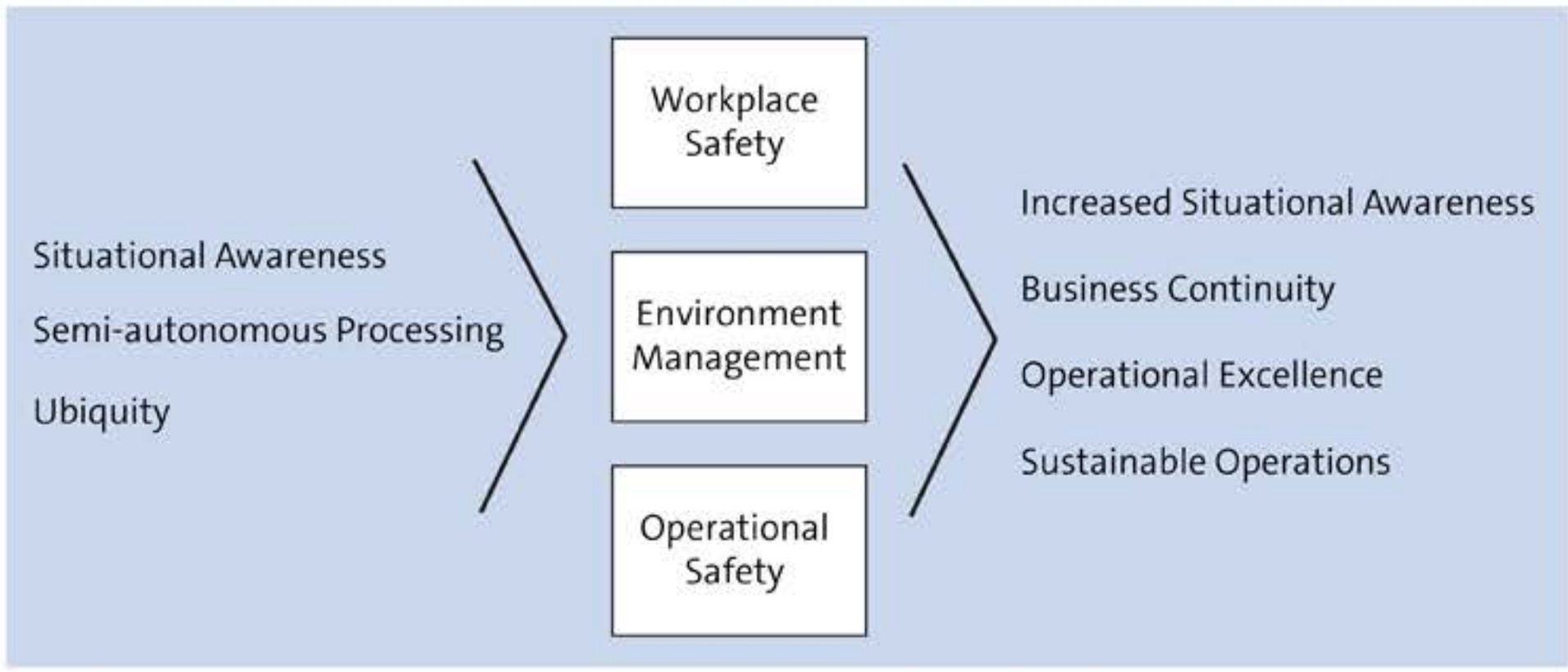


Figure 8.2 Attaining Desired Business Outcomes by Driving an Intelligent Approach with SAP

8.2 Advanced Functionalities

The following sections describe specific examples of use cases and functionality that is being considered for development in SAP EHS Management.

Semi-autonomous Processing with Artificial Intelligence and Machine Learning

The established trend of driving processes through artificial intelligence (AI) and machine learning is something that must be considered when planning the next generation of EHS software applications. There is a large volume of information and data being generated, being collected, or being analyzed based on all the various business processes we have covered in this E-Bite. EHS practitioners need systems to triage this data, serve up suggestion on what action to take, give forecasts, and create insight not readily apparent from the transactional data alone. The objective is to serve information and insight to the EHS function and operate on a level way beyond the base transactional systems of the past. With AI functions pulling information and creating new insight, the system also allows autonomous or semi-autonomous processing, where certain steps in the business process are handled directly by the system, or the system augments data entry or other tasks to free up the user. Essentially, it allows EHS practitioners to focus less on transactional data entry and more on the situation at hand. SAP EHS Management is part of the SAP S/4HANA digital core, and

will be able to leverage various tools SAP has created there and leverage tools that are part of SAP Business Technology Platform. The plan is to first focus on triage filters and suggestions that are semi-autonomous, leaving final decision-making to a human user.

Enhanced Situational Awareness Driven by Internet of Things-based Solutions

SAP EHS Management, at its heart, is a transactional system, securely collecting data for the EHS processes over time and making that available through reporting and analytics. The advent of mobile devices and apps along with "connected" devices within the Internet-of-Things (IoT) framework has created an opportunity for EHS practitioners to attain much higher levels of situation awareness across all operations in their organizations. Connected IoT devices and associated applications also create new ways for users to interact with software like SAP EHS Management and improve those transactional steps. They allow SAP EHS Management to act even more like a platform where information flows from connected devices and mobile apps into its databases without users having to click through browser screens at a desk. Better emergency response, faster reaction to incidents, reduced risk, reduced environmental impact, etc. are all possible benefits of incorporating IoT solutions into the overall system landscape for EHS. In Table 8.1 is a list of some of the most prevalent device types currently available to EHS practitioners.

Device Type	Use Case
Location Tracking	Dedicated devices or mobile apps that enable real-time location tracking, location history, and geo-fencing for both workers and their supervisors.
Gas Detection	Wearable devices or area monitors that will detect certain hazardous gasses that cannot be smelled or seen and track concentrations against thresholds, alerting users if thresholds are exceeded.
Noise Monitoring	Wearable devices or area monitors which track decibel levels in a work environment, alerting users if certain thresholds are exceeded. Exposure history is also relevant.
Exposure Monitoring	Wearable devices or area monitors which track chemical concentrations or other hazard parameters in a work environment, alerting users if certain thresholds are exceeded. Exposure history is also relevant.
Heat Stress Monitoring	Wearable devices or area monitors which primarily track temperature and humidity levels in a work environment, alerting users if certain thresholds are exceeded.

Table 8.1 Partial List of Relevant Device Types for Supporting EHS Processes

Device Type	Use Case
Fall Detection	Dedicated devices or mobile apps that utilize accelerometers and possibly AI processing to detect when a worker falls down. Alerts can be sent to supervisors and others. This can be important in the case of "lone workers."
Body Cameras	Connected real-time audio and video feeds sources from wearable cameras.
Drones	Not human-centric IoT, but still relevant for EHS purposes. Drones can perform emergency response, facility inspections, security, and detect hazardous conditions as a complimentary function to human personnel.
Smart camera systems	AI-based processing and other intelligent functions applied to security and shop-floor camera systems. Useful in detecting hazardous acts and hazardous conditions that may not be noticed by workers.
Water Quality sensors	Connected sensors tracking water chemistry parameters against limits set by permit or regulation. History may be relevant as well.
Air Quality Sensors	Connected sensors tracking air quality parameters against limits set by permit or regulation. History may be relevant as well.

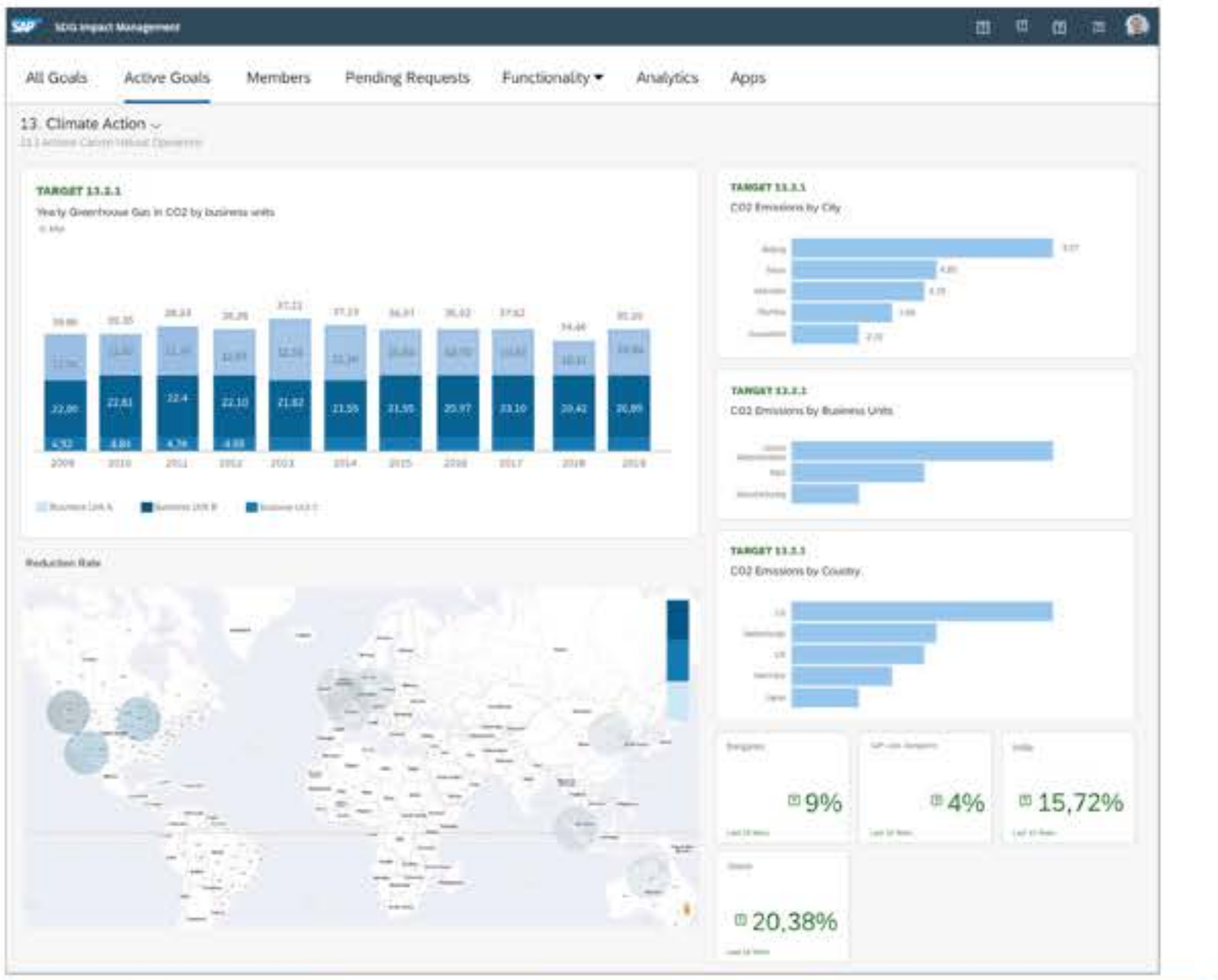
Table 8.1 Partial List of Relevant Device Types for Supporting EHS Processes (Cont.)

New User Experience Paradigm and Data Visualization Options

The SAP S/4HANA enterprise platform ushered in a new user experience standard for SAP solutions that is based on a technology branded as SAP Fiori. It is not in the scope of this E-Bite to explain the details of SAP Fiori, but suffice to say, it represents an improvement in usability and flexibility compared to previous structures in SAP ERP and SAP R/3.

SAP EHS Management is already leveraging the SAP Fiori 2.0 standard in most of its user interfaces, and the plan is to incorporate SAP Fiori 3.0 when it is full released. This latest version has additional options for user homepages, data feeds, and notifications in line with the transactional data applications.

Another area where user experience and presentation of data is expected to see further improvement is analytics and visualization. At a basic level, each new version of the SAP EHS Management applications may have more reports, more filters, and more visualization options as part of the embedded analytical tools. The plan is to move past the traditional bar charts and pie charts to provide a richer experience with geospatial views, predictive analytics, real-time video feeds, and more interactive views. Figure 8.3 shows some examples of what is possible.



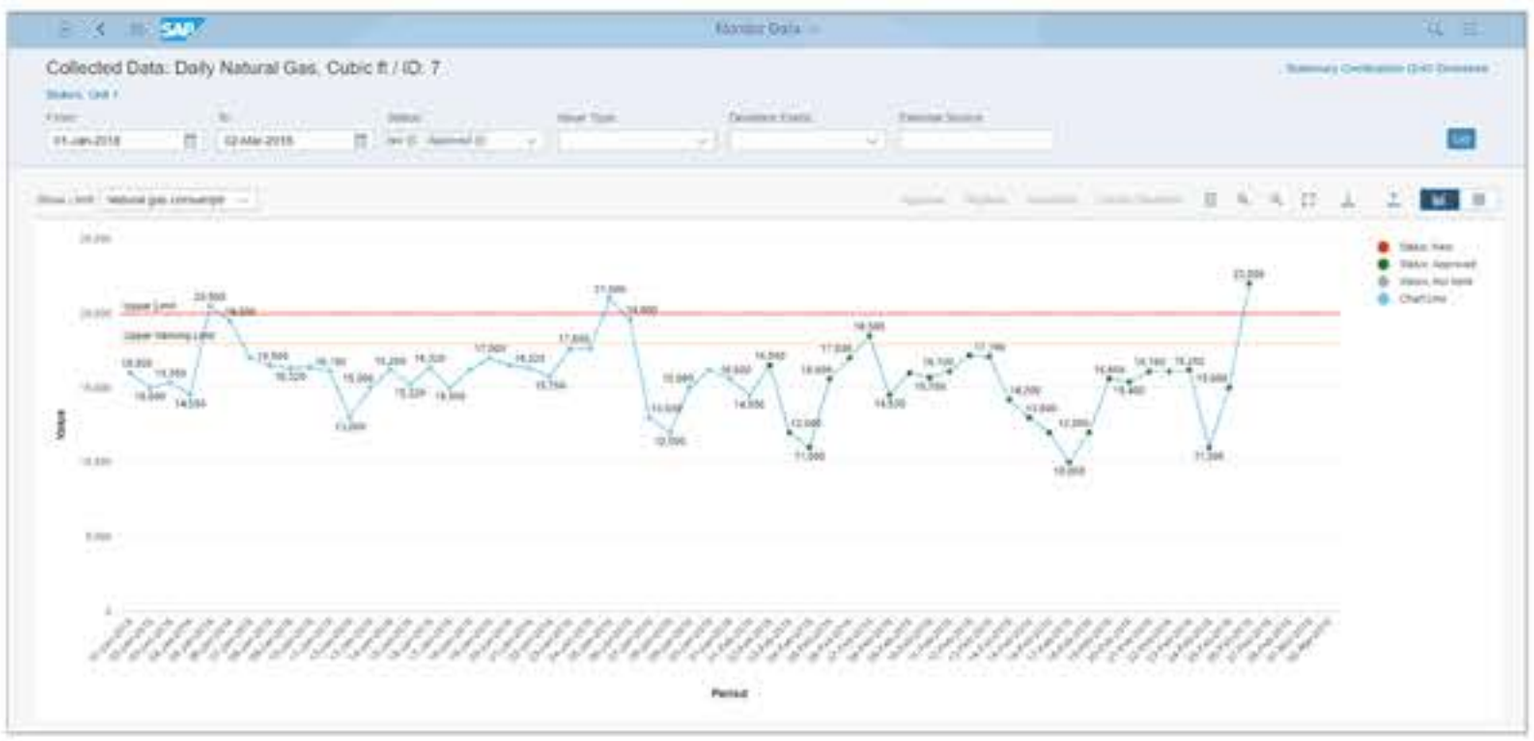


Figure 8.3 Views from SAP Analytics Cloud, SAP Visual Enterprise, and SAP EHS Management

8.3 Cloud-first Development

Beginning in 2019, the development teams responsible for SAP EHS Management functionality transitioned to an approach where new functionality will be developed first in cloud versions and then later rely on planned annual releases to deliver it on-premise. The focus is to drive cloud development and try to maintain functionality parity with on premise options. This is aligned with the overall SAP development strategy of focusing on cloud first.

At the time of this E-Bite publication, all functionality besides what is in the SAP EHS Management, health and safety management solution is available in both single-tenant private cloud offerings and a multi-tenant public cloud offering. This is a direct result of the change in development focus.

From a roadmap perspective, this focus on the cloud will continue, resulting not only in new software functionality, but the possible inclusion of additional content and configuration to better enable a cloud-based implementation.

8.4 A Focus on Sustainable Operations

We want to end this section, and the main text of the E-Bite, with a comment regarding the general path forward for SAP EHS Management as a software product and solution platform. SAP for many years has always put a priority on being an exemplar of running a business more sustainably and being a good corporate citizen. It has led to numerous awards and top rankings in various rating indexes like Dow Jones. SAP has now placed significant focus on building software products to help its customers become more sustainable, aligning with major trends in the market, but also in the world. The software company recently announced a whole suite of applications under the umbrella solution called *SAP Cloud for Sustainable Enterprises* in addition to investing to embed relevant functionality in existing line-of-business solutions for business planning and transportation. SAP EHS Management is a key source of information for different topics within SAP's sustainability portfolio and this positioning has led to ideas of evolving the platform into something that will better support a broader scope of sustainable operations overall.

9 What's Next?

EHS is just one part of managing a healthy, functional organization. Now that you've seen how EHS works in SAP S/4HANA, take a broader look at warehouse management with SAP S/4HANA or SAP EWM. Alternatively, check out a business user handbook to learn more about completing your daily plant maintenance tasks in SAP S/4HANA. If you're new to the world of logistics, discover how SAP S/4HANA can transform your supply chain with an introductory guide.

Recommendation from Our Editors

Get your warehouses up and running with *Warehouse Management with SAP S/4HANA* by Namita Sachan and Aman Jain! Get step-by-step instructions for configuring embedded and decentralized EWM in SAP S/4HANA. Learn how to implement key warehouse processes, from goods issue and receipt to picking and packing.

Visit www.sap-press.com/5480 to learn more about *Warehouse Management with SAP S/4HANA*!

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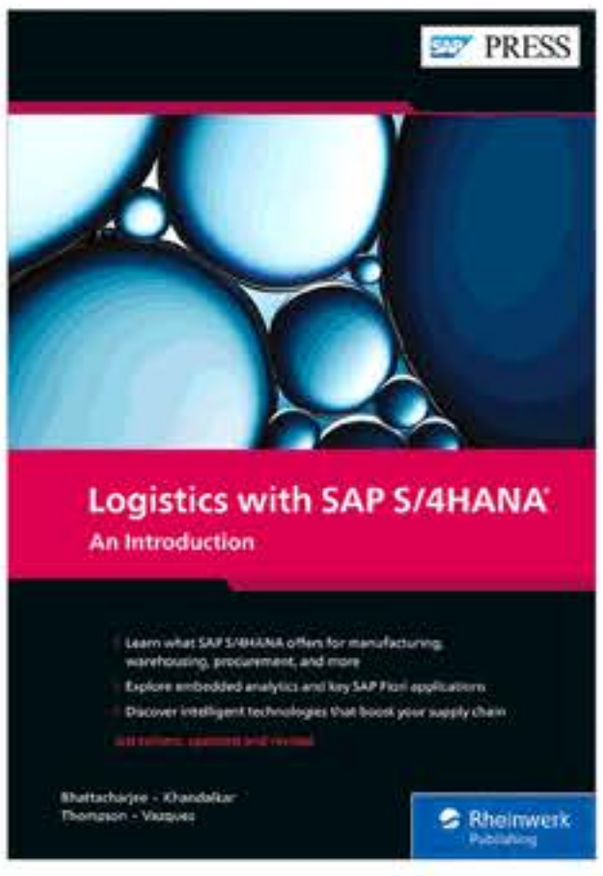

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The Author of this E-Bite

Michael Censurato is the global solution manager for the EHS applications offered by SAP, driving solution strategy and go-to-market efforts in all regions. He has more than 22 years of experience related to the design, development, and implementation of SAP EHS Management and sustainability software solutions. Before moving into solution management, Mike worked in SAP Services as a practice lead, application consultant, and project manager for implementation projects across multiple industries.

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