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Bureau of Transportation Statistics

Industry Safety Data Program for the Oil and Gas Industry Phase I Report

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ACKNOWLEDGEMENTS

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FOREWORD FROM THE BSEE DIRECTOR

The Bureau of Safety and Environmental Enforcement (BSEE) has entered a new era of management, which strives to improve safety performance and environmental stewardship beyond regulation through innovation and collaboration. *SafeOCS (Safe Outer Continental Shelf)* is one such example of how collaboration leads to continuous meaningful improvements – improvements which come from carefully reviewing and analyzing valuable information found only through the actual day-to-day operations on the Outer Continental Shelf.

A collaborative effort between BSEE, the Bureau of Transportation Statistics (BTS) and America's offshore oil and natural gas industry, the *SafeOCS* program draws its strength from the collective data voluntarily shared by participating oil and gas operators and service providers. This first report on voluntary safety and near-miss event reporting through *SafeOCS* is titled *Industry Safety Data Program for the Oil and Gas Industry: Phase I Report*. The report demonstrates the utility of understanding *near-miss events and safety events* and is a tangible step in preventing potential incidents from becoming actual incidents. This new report will join other publications available on the *SafeOCS* website: publications based on mandatory industry reporting that are titled *Blowout Prevention System Safety Events* and *Oil and Gas Production Safety System Events*.

The analyses of the data presented in the *Industry Safety Data Program for the Oil and Gas Industry: Phase I Report* depend upon the quality and quantity of the data available. Under the current administration, BSEE leadership understood this and engaged industry leadership by urging participation in *SafeOCS*. The results were overwhelming, and participation increased from operators accountable for 4 percent of oil production to operators representing more than 80 percent of oil production, a 2,000 percent increase. Although we have made great strides in increasing participation beyond the Phase 1 effort, we cannot rest there. BSEE will continue to encourage the industry to participate until there is 100 percent participation.

SafeOCS is one of many programs BSEE has implemented as we aspire to make oil and natural gas exploration, development, and production on the OCS as safe and environmentally sustainable as possible. The Risk-Based Inspection (RBI) Program, established in March 2018, employs a protocol of targeted, risk-focused inspections to supplement BSEE's existing schedule of inspections on production facilities and active drilling operations. Using data analysis to identify

higher-risk operations, BSEE is able to effectively direct additional inspections and resources where needed. BSEE has also significantly increased the number of published Safety Alerts and Bulletins. To further amplify the critical recommendations in the alerts and bulletins, BSEE initiated a text message alert system for industry personnel, *BSEE!SAFE*.

All of these initiatives share a central principle with *SafeOCS*: sharing and analysis of data can only move us forward in ensuring safe and environmentally sustainable operations on the OCS and in return provide for the Nation's energy security.

To all those who have voluntarily and anonymously reported near-misses through the *SafeOCS* program and to the BTS staff, we commend your leadership. To all those eager to learn from the report's findings, our hope is that you will use this publication to further enhance the safety and environmental sustainability of the OCS oil and natural gas industry. Working together, we can make a difference.

Scott A. Angelle

Director

U.S. Bureau of Safety and Environmental Enforcement

EXECUTIVE SUMMARY

The Industry Safety Data (ISD) Program is a voluntary reporting program that provides a means for companies in the offshore oil and gas industry to confidentially report sensitive and proprietary safety data, including data on safety-related events, near-misses, and other pertinent information. Professional statisticians and industry experts perform comprehensive analysis to identify safety trends within the U.S. Outer Continental Shelf (OCS), and aggregated results are shared with key entities to support continuous safety improvement. The Department of Transportation's Bureau of Transportation Statistics (BTS) independently operates the ISD Program, which is a component of SafeOCS and is supported by the Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE).

The objective of the ISD Program is to capture a range of safety data, including reportable and non-reportable events and unsafe conditions or behaviors, that are observed prior to a more significant event occurring. This type of data has not previously been captured on an industry-wide basis.

The Phase I dataset contains records on 8,631 safety events submitted by the nine participating companies. These events occurred in the Gulf of Mexico (GOM) on the OCS during 2014-2017. Results of the data analysis are grouped into three focus areas: *process safety*, *personal safety*, and *environmental stewardship*. These focus areas reflect different categories of hazards that may be present in offshore oil and gas operations. Although the results described in this report represent only nine companies, and thus should not be interpreted as being representative of the entire offshore industry sector, they illustrate the data analysis process that could be implemented for an industry-wide ISD Program as participation grows.

ISD Phase I successfully demonstrated the feasibility of the ISD Program where data sharing and collaboration within the industry to identify precursor data is effective and can yield industry-wide safety insights. Phase I demonstrated that it was possible for companies to submit data to BTS in different formats, and for BTS to map the data to a common database that allows for effective and meaningful data aggregation, review, and analysis. Phase II, which will be referred to as the ISD Program moving forward will focus on expanding industry participation, disseminating learnings from the ISD report, and enhancing program capabilities.

The key learnings and recommendations from Phase I are:

- ISD Phase I participating companies agreed on the value of sharing data for both consequential and lesser events which had the potential to lead to a major event.
- Legal and confidentiality concerns expressed by participating companies were satisfied with the protections afforded under the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) and with the signing of a Memorandum of Agreement (MOA) between BTS and individual participating companies.
- A process was developed to map disparate data from individual companies to a single database thereby successfully addressing the technical challenge associated with collecting, mapping, and aggregating data from different company-specific databases.
- The Phase I participating companies collectively identified core data fields to be shared in order to generate meaningful learning opportunities for industry to further improve safety.
- Phase I was limited to nine participating companies operating in the GOM OCS. Despite the limited data, it was possible to conduct meaningful analyses of the aggregated data.
- Companies are encouraged to provide data for all the identified core data fields in order to effectively aggregate the information and identify meaningful data trends.
- Companies are encouraged to submit additional information about unsafe actions or conditions (e.g., safety observations) because under certain conditions a subset of them can potentially become precursors to safety events.
- Companies are encouraged to consider how they can improve integration or harmonization of their company's data systems. In addition, BTS plans to expand the use of drop-down menus instead of text fields to harmonize data entries and address data field inconsistencies and misspellings stemming from company-specific terminology.
- Given that a key premise of the ISD Program is to capture more than what is currently required, all participants are encouraged to provided data related to safety events that may occur while off-shift.
- Companies are encouraged to provide more detailed information on causal factors, when available.

1 Introduction

This report represents the culmination of ISD Phase I, the initial effort to demonstrate the feasibility of the ISD Program. Phase I was designed and implemented with the assistance of nine companies who currently operate on the U.S. Outer Continental Shelf (OCS) and expressed an interest in working with BTS. Following an overview of the overarching ISD Program goals and rationale, the report discusses the process for developing ISD Phase I, results of the Phase I data analysis, learnings from Phase I, and planned next steps.

1.1 SOLVING FOR A GAP

Across industries, companies have long realized the benefits of collecting and analyzing data around safety and environmental events to identify risks and take actions to prevent reoccurrence. These activities have been supported by industry associations that collect and share event information and develop recommended practices to improve performance. In high-reliability industries such as aviation and nuclear energy, it is common practice to report and share events between companies and for the regulators to identify emerging safety trends and create or update existing recommended practices, regulations, or other controls.

The challenge for the offshore oil and gas industry was that industry associations and BSEE were collecting data on events reportable to BSEE, but other high value learning events or observed conditions/behaviors could go unnoticed as a trend until a major event occurred. This represented an opportunity for the industry and BSEE to collaborate on an approach to collect safety event data that would allow for analysis and identification of trends, thereby leading to appropriate interventions to prevent major incidents and foster continuous improvement. Supplementing existing systems and processes for reporting events would enable all entities in the industry to gain insight from a broader range of safety events. Key aspects of SafeOCS ISD Program include:

- Providing a central repository for a safety-related data collection, its analysis, and sharing of learnings;
- Identifying the type of data that may provide valuable information;
- Gaining alignment within industry on event data definitions and associated metadata;

- Utilizing a secure process for collecting data that provides protection from legal action against data submitters and the raw data cannot be used for regulatory development purposes or enforcement;
- Implementing a robust methodology for identifying systemic issues;
- Disseminating the findings to stakeholders who can then take actions to reduce or eliminate risks in the focus areas of process safety, personal safety, and environmental stewardship; and
- Providing opportunities for participating companies to compare their data against aggregated results.

The concept of sharing lessons learned from safety events aligns with BSEE's Safety Culture Policy Statement[1] wherein BSEE encourages companies to seek out and implement "continuous improvement opportunities to learn about ways to ensure safety and environmental stewardship." Other elements of BSEE's safety culture policy that directly support the SafeOCS ISD Program include:

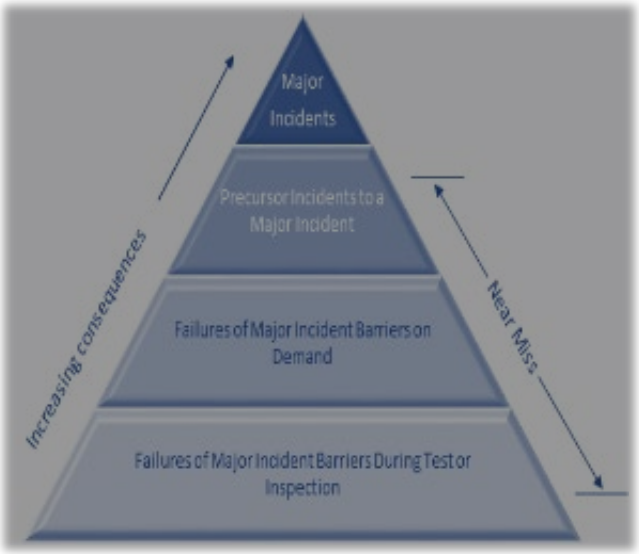
- Focusing on hazard identification and risk management to flag issues potentially impacting safety;
- Encouraging interest in continuously examining existing conditions and activities to identify discrepancies that might result in inappropriate action; and
- Maintaining an open and effective safety communication environment. attributes

[1] BSEE Final Safety Culture Policy Statement, May 2013.

1.2 The Importance of Capturing and Sharing Safety Event Data

Major incidents are rare, however, there is no number of major incidents that should be considered an acceptable consequence of offshore oil and gas operations. Thus, it is important to collect information on precursor events that might indicate the potential for a major incident. An understanding of precursor events, such as near-misses, and high-value learning events can help with identifying barrier integrity as it relates to incident prevention and mitigation. Barriers are systems, processes, or engineering solutions that are designed to prevent incidents from occurring. The scope of data with potential for learning opportunities ranges from major incidents, such as significant injuries or fatalities, to near-miss events and observations of unsafe conditions and/or actions, as depicted in the safety triangle in figure 1.

Figure 1: Safety Triangle



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Various studies have corroborated a many-to-one relationship between lesser and increasingly (more) significant incidents. The types of events, conditions, or behaviors that are noted in precursor events could be used to inform the strengthening of barriers that are intended to reduce or eliminate the chance of an incident.

Therefore, the objective of the ISD Program is to capture this data so they can be analyzed for trends. The learnings can then be shared and implemented with the goal of preventing more serious events. This approach allows all companies working on the OCS to prioritize resources to ensure presence of controls in place to minimize the risk of a significant event.

1.3 Calls to Action

Numerous government and industry studies have arrived at similar conclusions regarding the value of industry data sharing and learning. Some of these conclusions are summarized below (*emphases added*).

- International Regulator's Forum (IRF) on Global Offshore Safety[2]

  "The opportunity for the next step change in safety performance appears to be in a substantial increase in the sharing of data across industry… The IRF *calls upon industry to recognize the value of this data sharing* in the improvement in safety performance and take this on as a priority by the board and CEOs of the respective industry companies."

- European Commission – "Safety of Offshore Oil and Gas Operations: Lessons from Past Accident Analyses"[3]

  "The overall picture of accident reporting looks like a mosaic or a puzzle: there are many pieces available, but it is very difficult to put them together to get the full image. The main conclusions after the exploration of accident data sources are:

  - There is a *clear need for pooling of data* to have a complete picture of the safety in offshore sector..."

- National Academies of Science, Engineering, and Medicine - "Macondo Well Deepwater Horizon Blowout - Lessons for Improving Offshore Drilling Safety"[4]

  "Industry, [BSEE], and other regulators should improve corporate and industrywide systems for reporting safety-related incidents. *Reporting should be facilitated by enabling anonymous or "safety privileged" inputs…near misses and accident precursors should be tracked* as a way of supporting a proactive risk management system."

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[2] International Regulators Forum on Global Offshore Safety, June 2018

[3] European Commission – "Safety of Offshore Oil and Gas Operations: Lessons from the Past Accident Analyses," December 2012

[4] National Academies of Science, Engineering, and Medicine, "Macondo Well Deepwater Horizon Blowout – Lessons for Improving Offshore Drilling Safety," 2012

- National Commission Report to the President on the BP Deepwater Horizon Oil Spill and Offshore Drilling: "Deepwater – The Gulf Oil Disaster and the Future of Offshore Drilling"[5]

  "Such [*offshore incident and "near miss"] data collection would allow for stronger risk assessments and analysis*. … *Sharing information* as to what went wrong in offshore operations, regardless of location, is key to avoiding such mistakes."

- Society of Petroleum Engineers (SPE) Technical Report: "Getting to Zero and Beyond: The Path Forward – Improving Safety in the Oil and Gas Industry"[6]

  "[T]he industry must unequivocally set an expectation of zero harm and urgently commence with the required breakthrough in thinking, collaboration and an approach to achieve zero harm. For the industry, this includes the following: . . .

  - De-emphasize lagging performance indicators (injury rates) and *utilize more leading indicators to ensure a progressive and preventative focus* on the effectiveness of safeguards and risk reduction.
  - Establish a no-risk-to-sharing culture - a commitment of collaboration - across the industry with the expressed intent to overcome perceived risks and competition barriers."

- National Academies of Science, Engineering, and Medicine: "The Human Factors of Process Safety and Worker Empowerment in the Offshore Oil Industry – Proceedings of a Workshop"[7]

[5] National Commission Report to the President on the BP Deepwater Spill and Offshore Drilling: "Deepwater – The Gulf Oil Disaster and the Future of Offshore Drilling," January 2011

[6] SPE Technical Report: "Getting to Zero and Beyond: The Path Forward – Improving Safety in the Oil and Gas Industry," March 2018

[7] National Academies of Science, Engineering, and Medicine, "The Human Factors of Process Safety and Worker Empowerment in the Offshore Oil Industry – Proceedings of a Workshop," 2018

- "*Increased amounts of data could be gathered from the offshore oil industry and combined with existing behavioral science data* to improve training and leadership programs throughout the industry."
- "A considerable amount of data already exists if they could be accessed...[P]rocesses for placing this information in [a] database are being discussed, but...protections will be needed to make that happen."

- SPE Summit: "Safer Offshore Energy Systems – Summary Report"[8]

  Among the near-term opportunities identified to improve safety offshore, data collection and analytics rose near the top of the list of themes that are important for industry to focus on, including, for example, the *need for better leading indicators* and how to build predictive indicators.

1.4 ROLE OF THE PHASE I PLANNING TEAM

A key success of Phase I of the ISD Program is the framework that was developed with direct input from industry to ensure that any data captured had learning value for its participants. A related objective was to ensure representation from an appropriate mix of companies working in the Gulf of Mexico (GOM), including operators, service companies, and drilling contractors. To meet this expectation, a Planning Team was formed consisting of senior management and Health, Safety and Environment (HSE) expert representatives from nine (9) companies who were interested in becoming early implementers of the program.

These companies volunteered their staff time and resources over the course of nearly two years to assist BTS in the groundwork required to design the SafeOCS ISD database. This was accomplished through a series of 16 group meetings and many company-specific (individual) interactions aimed at sharing internal stewardship best practices and processes. An important outcome of these efforts was identification of the baseline core data fields that became the

[8] SPE Summit, "Safer Offshore Energy Systems – Summary Report," August 2018

foundation of the SafeOCS ISD Program. Arriving at agreement involved a detailed discussion of each proposed data field to ensure that the information captured would enable industry to have meaningful discussions of the results and prospective mitigative measures that could be taken to enhance safety in the field. The result of their efforts is the ISD Phase I proof of concept discussed in this report.

1.5 ROLE OF THE BUREAU OF TRANSPORTATION STATISTICS

To move from vision to implementation, BSEE entered into an interagency agreement with BTS to oversee development and management of the ISD Program. As a statistical agency, BTS has considerable data collection and analysis expertise and the statutory authority under the *Foundations for Evidence-Based Policymaking Act of 2018, Subchapter III, Confidential Information Protection and Statistical Efficiency (CIPSEA), 44 USC Ch. 35* to protect the confidentiality of the reported information. BTS has also developed and operated confidential near-miss reporting systems for the railroad and metro transit industries, and it has a detailed working knowledge of data management systems utilized by other industry sectors. BTS received slightly over 130,000 data records for the four-year period (2014-2017) covered in Phase I. Those records were reduced to 8,631 discussed in this report after limiting the dataset to events that occurred in the GOM and excluding duplicate records.

BTS is also the designated repository for two other components of SafeOCS in addition to ISD: 1) the Well Control Equipment Failure Reporting Program (WCR), and 2) the Safety and Pollution Prevention Equipment Failure Reporting Program (SPPE). These programs involve equipment failure reports required under BSEE regulations. Like the ISD Program, BTS ensures CIPSEA protections for the WCR and SPPE failure reports submitted to BTS, aggregates and analyzes these submissions, and produces annual reports to support continuous safety improvement.

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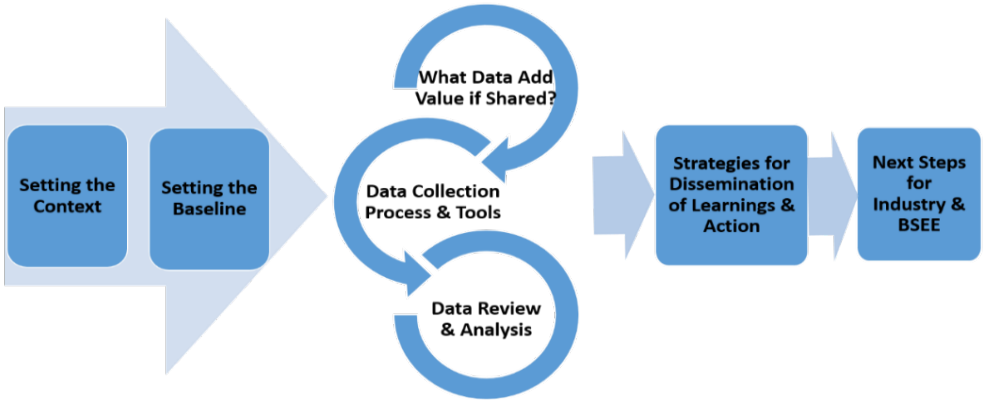
2 Development of ISD Phase I

2.1 Laying the Groundwork: SPE/BSEE Summit

From 2014-2016, BSEE and the Society of Petroleum Engineers (SPE) worked with a team of industry representatives, as well as BTS, aviation, and shipping experts to identify potential best practices for the capture and sharing of key learnings from safety and environmental events that were not currently being captured. The collaboration culminated in BSEE and SPE co-sponsoring a summit in April 2016 that included 62 representatives from 47 companies, both within and external to the oil and gas industry, to discuss what it would take to develop an industry-wide safety data management database. The agenda for the summit is shown in figure 2. The summit Technical Report[9] included an action item to create and pilot a process and database for aggregating and analyzing industry safety data as part of a centralized framework.

Figure 2: 2016 SPE/BSEE Summit Agenda



SOURCE: SPE Technical Report: Assessing the Processes, Tools, and Value of Sharing and Learning from Offshore E&P Safety Related Data," September 2016

[9] "SPE Technical Report: Assessing the Processes, Tools, and Value of Sharing and Learning from Offshore E&P Safety Related Data," September 2016

Although the scope of the summit initially focused on near-misses, the summit participants expanded the scope to include a broader range of safety data with learning value. The change in scope was intended to better position the effort to aid industry in achieving improved safety performance. Ultimately, the summit also had the overarching goal of creating an additional layer of reporting expectations beyond the current requirements by regulators and industry associations.

2.2 INITIATING ISD PHASE I

Following issuance of the SPE Technical Report, BTS initiated efforts to form a team of companies interested in participating in ISD Phase I. Invitations were sent to individual companies asking them to participate in the Phase I effort as early implementers and to assist BTS in designing the safety data management framework. Once nine (9) companies expressed interest, the Phase I effort commenced. The nine companies represented a cross-section of companies operating in the Gulf of Mexico (GOM) as it included a mix of operators and critical service providers.

In January 2018, BTS formed the Phase I Planning Team consisting of subject matter experts from each of the nine companies. The team agreed that the primary objective of Phase I was to develop a *proof of concept* for a proposed industry-wide safety event database, and the team also recognized the importance of industry input to maximize benefits of the end products. The Planning Team members further agreed on the following scope of their responsibilities:

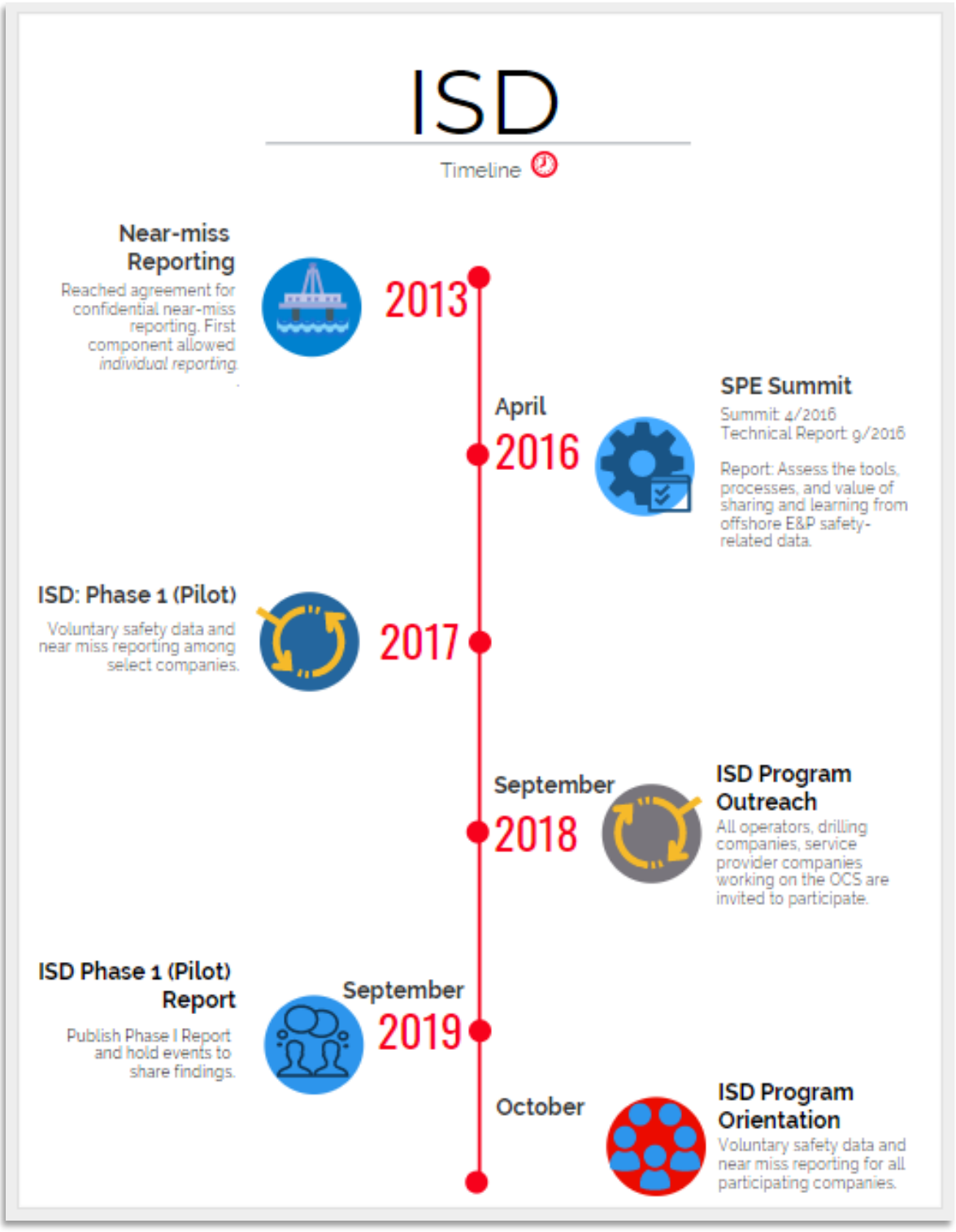
- Discuss the type of data that should be submitted to ensure that the data captured has appropriate learning value, which may include, but is not limited to reportable and non-reportable events, near-misses, observations, unsafe conditions, stop work events, and associated metadata.
- Coordinate with BTS on the effectiveness of the ISD Program design and process, including potential enhancements to consider for the data aggregation and review processes.
- Review the ISD draft report and provide feedback prior to BTS approval and release.
- Participate (if desired) in one or more Data Review Teams, as appropriate, or suggest alternative representatives from their respective companies to be Data Review Team members. (The next section discusses Data Review Teams in more detail.)

It was important to set realistic and achievable goals for the desired outcomes of Phase I recognizing that such an effort to collect and analyze data across the industry had not been undertaken before. As such, the key objectives for Phase I were as follows:

1. Develop a process that overcomes the challenges of collecting and aggregating safety data from disparate company-specific databases, without requiring those companies to reformat their data;
2. Test the data aggregation process to identify and merge (as appropriate) potential duplicate records for the same event;
3. Analyze the aggregated dataset and present findings on trends or events of significance; and
4. Provide recommendations on how the industry might utilize and benefit from SafeOCS ISD reports.

Meetings between BTS and the Planning Team members were held from July 2018 through April 2019 to review and discuss the aggregated data, as well as to brainstorm program enhancements that should be considered moving forward. These meetings also addressed how best to characterize the aggregated data to provide optimum sharing and learning opportunities for industry. A summary of the overall timeline of key events is depicted below (figure 3).

Figure 3: Timeline for Developing an Industry-Wide Safety Event Framework

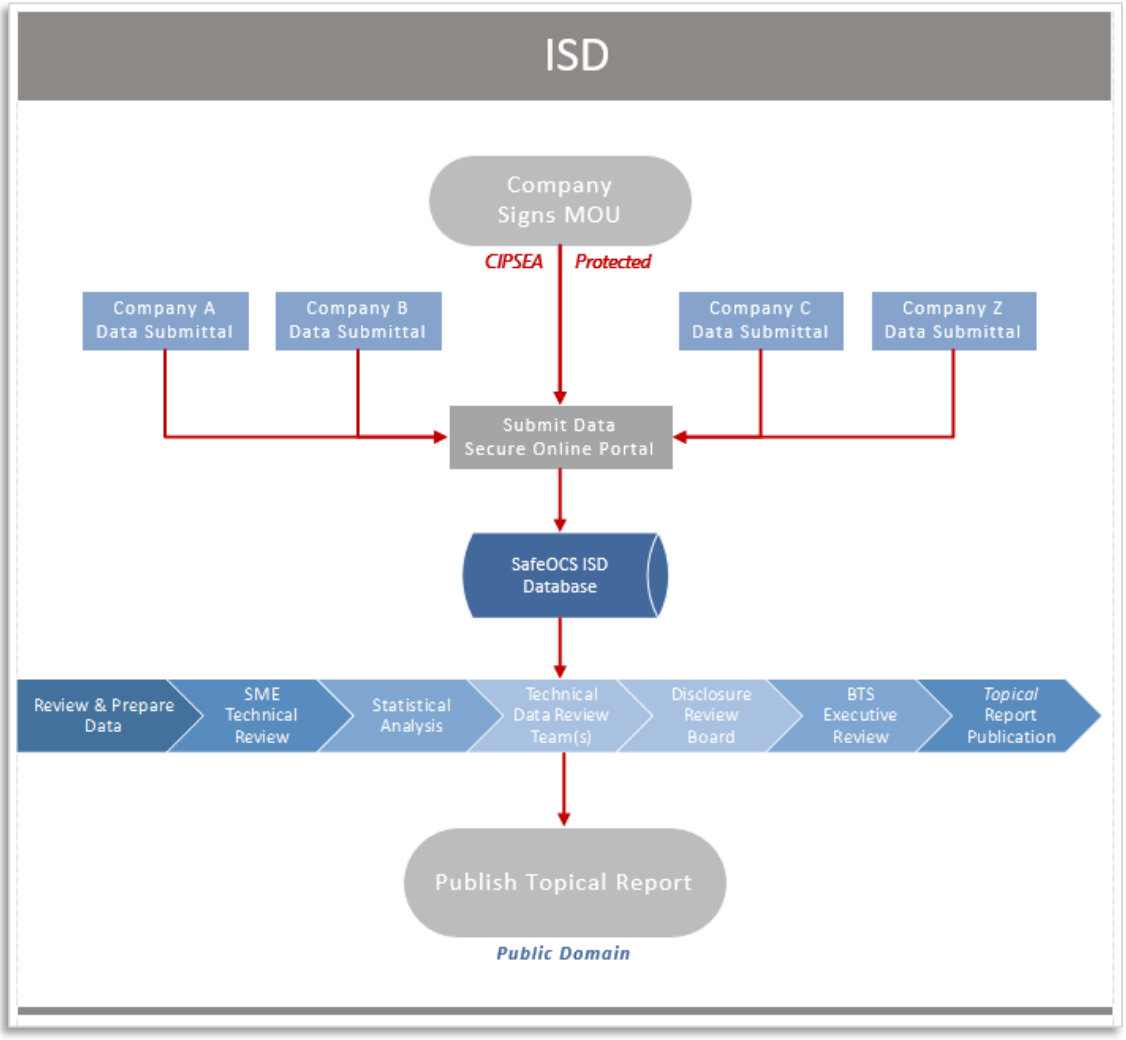


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019
NOTE: Exploration and Production (E&P)

3 ISD Phase I Governance Process

The ISD Phase I effort resulted in the development of a process for data collection, analysis, and dissemination. Since Phase I was a pilot, its governance process was fully developed over the course of the effort. Moving forward, the ISD Program will follow a substantially similar governance process; where differences exist, they are noted below. The overall process that governed ISD Phase I is described in the subsections below (figure 4).

Figure 4: ISD Data Process Overview



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

3.1 AGREEMENT WITH BTS

Each of the nine companies executed an agreement with BTS that detailed the scope of

engagement between the company and BTS:

- Type of data to be submitted (i.e., safety and environmental events, near-misses, etc.);
- Event date ranges (i.e., number of years) of submitted data;
- Format of the dataset to be provided to BTS;
- Company's expectations regarding data review and analysis of its own data; and
- Company's rights to its own data.

Moving forward after Phase I, new ISD participants will execute a Memorandum of Agreement (MOA) with BTS when they decide to participate. The MOA addresses the same information as the agreements used for ISD Phase I participants.

3.2 Data Submittal

Upon signing the agreement, each company submitted data to BTS for inclusion in the ISD Phase I database via an online portal or via an encrypted storage device. Online portal users created a profile through the SafeOCS website which employs a two-factor authentication method for login. This process ensures that data files are subject to the confidentiality protections of CIPSEA. An overview of BTS and CIPSEA is provided in SafeOCS.gov. Moving forward, the option to submit data via an encrypted storage device will remain, however most companies are expected to choose to submit data via the online portal for ease of use.

3.3 Data Review and Processing

BTS staff, with assistance from independent industry subject matter experts (SMEs), processed and prepared the data for further review and analysis. BTS mapped all submitted data to the core data fields in SafeOCS ISD to allow for effective and meaningful aggregation and analysis. Key focus of the review was to identify multiple reports for the same event due to data submittals from more than one source (e.g., operator, service company, drilling contractor, and construction contractor). To avoid duplication, BTS used data matching and data mining techniques to consolidate information from multiple reports on the same event.

3.4 Statistical Analysis

After the initial data preparation, BTS analysts explored the data and formed hypotheses.

Assisted by independent industry SMEs, BTS conducted analyses of the aggregated core data to identify trends and specific high-value learnings.

3.5 Data Review Team

BTS established a Data Review Team to assess, review, and analyze data to identify trends and specific high-level learnings. The Data Review Team comprised industry SMEs (participant representatives) from the nine participating companies, as well as BTS staff and independent industry SMEs working for BTS. Each team member received confidentiality training, signed a Non-Disclosure Agreement (NDA), and were designated as agents under CIPSEA. Unlike the independent industry SMEs who assist BTS staff, industry (participant) SMEs assess and analyze only aggregated data. Considering their positions within industry, they are only allowed to access and analyze their own company data.

The Data Review Team also assisted BTS with preparation of the draft report capturing the results of the+ aggregated data analyses and observations. All work performed by Data Review Team members took place in designated secure work spaces within the BTS facilities.

3.6 Disclosure Review Board

BTS also established a Disclosure Review Board to review the draft report in accordance with CIPSEA disclosure requirements and expected compliance with principles and practices of a statistical agency. For Phase I, the Data Review Team served as the Disclosure Review Board. The Disclosure Review Team responsibilities included ensuring that the identity of individuals and data contributors are protected from direct and indirect disclosure. Moving forward, the Data Review Team(s) and the Disclosure Review Board will differ in membership.

3.7 BTS Internal Review Process

Based on recommendations from the Disclosure Review Team, all final determinations of whether to disclose a final document rest solely with the BTS Confidentiality Officer. Thus, within BTS, the report was reviewed by the ISD Program Director prior to final review and approval by the BTS Director.

3.8 REPORT PUBLICATION

Upon publication of this report, industry may engage with academia and other public and private entities [i.e., BSEE, US Coast Guard (USCG), Center for Offshore Safety (COS), Offshore Operators Committee (OOC), American Petroleum Institute (API), International Association of Oil and Gas Producers (IOGP), Society of Petroleum Engineers (SPE), International Association of Drilling Contractors (IADC), academia, etc.)[10] to address the report findings. BTS may also act as the technical representative on statistical issues and data quality issues.

[10] See Appendix F for acronym names.

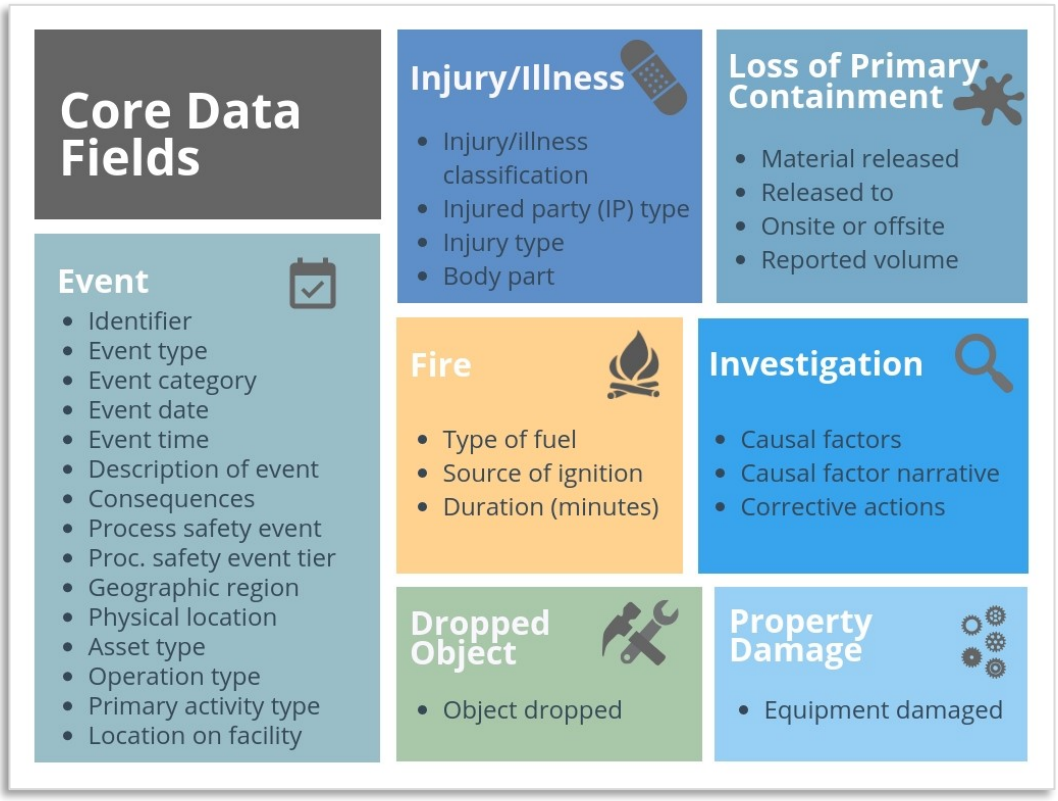
4 Phase I Study Protocol

With input from the ISD Phase I Planning team, BTS developed a study protocol, including the *scope of core data* fields to be included and the *data mapping* (process for conforming data to the standardized template).

4.1 Scope of Core Data

A key focus area for the Phase I Planning Team was to identify the core data fields that should be considered for SafeOCS ISD. After comparing what each company was capturing, the group agreed that collecting the core data fields listed in figure 5 would deliver the most value to industry and enhance industry's ability to learn from safety events. A more detailed listing of the sub-categories (i.e., drop-down menus) for each of the core data fields is provided in Appendix A. Definitions for the key terms are provided as part of the Glossary in Appendix C.

Figure 5: ISD Database Core Data Fields



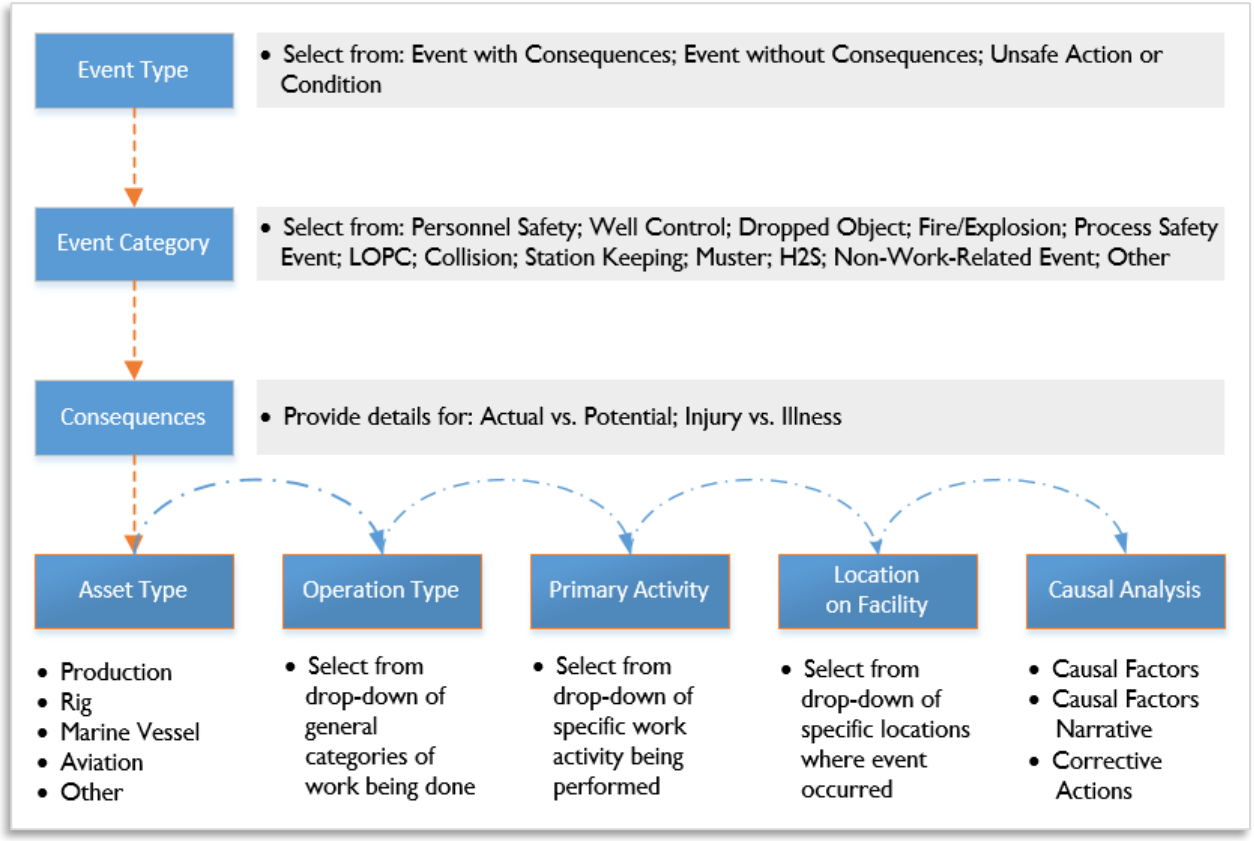
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

4.2 Data Mapping Process

Working with SMEs, BTS mapped all data submissions to a standardized format to allow for data aggregation. BTS analyzed in detail the aggregated data to demonstrate what can be accomplished on an industry-wide basis to gain a better understanding of causal factors and emerging safety trends. All data reviewers were subject to non-disclosure requirements mandated by CIPSEA.

The data mapping process entailed matching the company's data to the SafeOCS ISD core data fields to provide consistency in how data are captured and allow for a more meaningful analysis. Each company's datasets were first limited to events that occurred in the Gulf of Mexico OCS. A SafeOCS ISD *codebook* was then developed to aid BTS staff (assisted by internal SMEs) with consistently mapping company-specific data submissions to the SafeOCS ISD database. A copy of the SafeOCS ISD Codebook is provided for reference in Appendix A.

Figure 6: Data Mapping Process for ISD Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019

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Each event was reviewed in the following manner (figure 6):

1. The **event type** was designated as either an event *with* or *without consequence* or an *unsafe condition* or *act* (e.g., safety observation).
2. Each event was then assigned to the overarching **event categories** that were involved. Note that any single event can involve multiple issues/attributes, so more than one category may apply (e.g., an LOPC event might also be classified as a process safety event depending on event circumstances).
3. **Consequences** of the event, if any, were identified, such as whether the event resulted in an injury or illness. For an event without consequence, such as a near-miss, the potential consequence was entered if it was available as part of the data submitted by the company.
4. Once the event characteristics had been mapped, the focus shifted to where the event occurred (**asset type)** and during what specific activities (**operation** and **activity type**).
5. The last step in the data mapping process focused on investigation of the incident and any identified **causal factors**, as this is likely where most of the key learnings will be identified.

For the causal analysis (step 5 above), Phase I members agreed to use a list of fifteen (15) *Areas for Improvement* (AFI) developed by the Center for Offshore Safety as a starting point, with the addition of three (3) supplementary causal factors (leadership, human factors, and human performance) based on the data submitted as well as BTS' experience in analyzing data from other industries. The final set of eighteen (18) causal factors are listed in figure 7, and the supporting definitions are included in Appendix B.

Figure 7: ISD Event Causal Factors

GENERAL CATEGORY	CAUSAL FACTOR
PHYSICAL FACILITY, EQUIPMENT, AND PROCESS	• Process equipment and design • Process or equipment material selection, fabrication, and construction • Process or equipment reliability • Instrument, analyzer, and controls reliability
ADMINISTRATIVE PROCESSES	• Risk assessment and management • Operating procedures or safe work practices • Management of change • Work direction of management • Emergency response
PEOPLE	• Personnel skills or knowledge • Quality of task planning and preparation • Individual or group decision-making • Quality of task execution • Quality of hazard mitigation • Communication • Human factors • Human performance • Leadership

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

4.3 PHASE I DATA REVIEW AND ANALYSIS

The results of the data review and analysis process described here are illustrative of what could be implemented for the SafeOCS ISD Program as participation grows. It is important to note that the results, trends, and observations presented in this section are representative of only the nine companies participating as early implementers and should not be interpreted as being representative of the entire offshore industry sector.

DATA DESCRIPTION

For Phase I, nine companies submitted industry safety data for 2014-2017. In total, BTS received records for 9,668 events. The total number of events included for analysis in Phase I was 8,631 after excluding *land-based* (656) and *non-work-related offshore* (381) events. The submitted data was in different formats, spanned across different years, and included different geographic regions. Though all nine companies submitted data, not all submitted data for each reporting year and some companies included events that were outside of Gulf of Mexico OCS.

To allow focus on offshore activities, the data analyzed excludes events occurring on land-based support facilities, such as shore bases, fabrication yards, and shipping terminals. Also excluded were events that occurred at the terminal or heliport unless the marine vessel or helicopter was *en route* to or from an offshore location.

Of the offshore events, 4.2 percent were considered *non-work-related* as defined by OSHA 1904.5(b)(2). For example, a non-work-related event could be an illness or injury that occurred off property and was not resolved before going offshore. Other examples of non-work-related events excluded were security violations; drug and alcohol violations; personal illnesses or health conditions; and injuries identified by the submitting company as non-work-related because they occurred while the employee was off duty. Of the non-work-related events, nearly three-quarters involved an injury or illness that happened *off property* (e.g., cold/flu related symptoms or a back injury doing home yard work that caused pain while the employee was offshore); approximately one-fifth involved *off duty* injuries occurring in or near the crew accommodations (e.g., getting in/out of bunk beds, slipping in the shower, tripping on stairs, etc.); and a few events involved *possession of banned items* (alcohol, drugs, etc.).

BTS received a small number of Behavior Based Safety (BBS) records, which were excluded from the analysis performed for Phase I. BBS is a process where an employee provides feedback to a peer on their safety behavior after observing them work. The process is intended to identify unsafe behaviors and acknowledge and reinforce safe behaviors to improve safety performance. Similar programs (sometimes with different names) are used in different companies, but they are all primarily *peer to peer* and involve some type of *observation* document to record what was observed. Several companies capture the observations data in a separate database and that information was not submitted to BTS. If BTS receives a large enough sample of this type of data in the future, it can be analyzed for subsequent reports.

ANALYSIS SECTION STRUCTURE

The data analysis section starts by examining overall information about the 8,631 events. Results are then grouped into three focus areas: *process safety*, *personal safety*, and *environmental stewardship*.

Process safety hazards in the oil and gas industry generally involve the potential release of harmful substances arising from operations of a drilling rig or production platform (e.g., well or production operations). Process safety hazards have the potential for serious consequences, such as loss of the facility, fatalities, damage to the environment, or harm to the company's reputation and financial health. Significant process safety incidents are typically low-frequency high-consequence events. Because these types of incidents are relatively infrequent, an important source of data is the leading indicators that may be found among incidents in the bottom portion of the safety triangle.[11]

Personal safety hazards involve the potential for harm to personnel due to injury or illness. Most injuries and fatalities arise from personal safety hazards rather than process safety hazards, and many companies employ mature data collection processes for personal safety incidents at all

[11] See also, Int'l Assoc. of Oil & Gas Producers, Process safety – Recommended practice on Key Performance Indicators, Report No. 456, Nov. 2018 ("[Because process safety failures are relatively infrequent, it is] necessary to broaden these analyses to learn from events with less serious outcomes.")

levels of the safety triangle. As with process safety, an opportunity exists to seek additional learnings from personal safety events that are often viewed as less significant but given different circumstances could result in injury. The SafeOCS ISD Program seeks to capture personal safety data to support the identification and development, or improvement of the appropriate risk controls such as training, operating procedures and practices, or competency assessments.

Environmental stewardship hazards have the potential to harm ecosystems by polluting waters, killing wildlife, and/or contaminating habitats. Given the sensitivity of the environments where offshore activities occur, companies working in the GOM must exercise appropriate practices to protect the environment. The SafeOCS ISD Program seeks to capture events involving environmental hazards to support the development and/or improvement of appropriate controls.

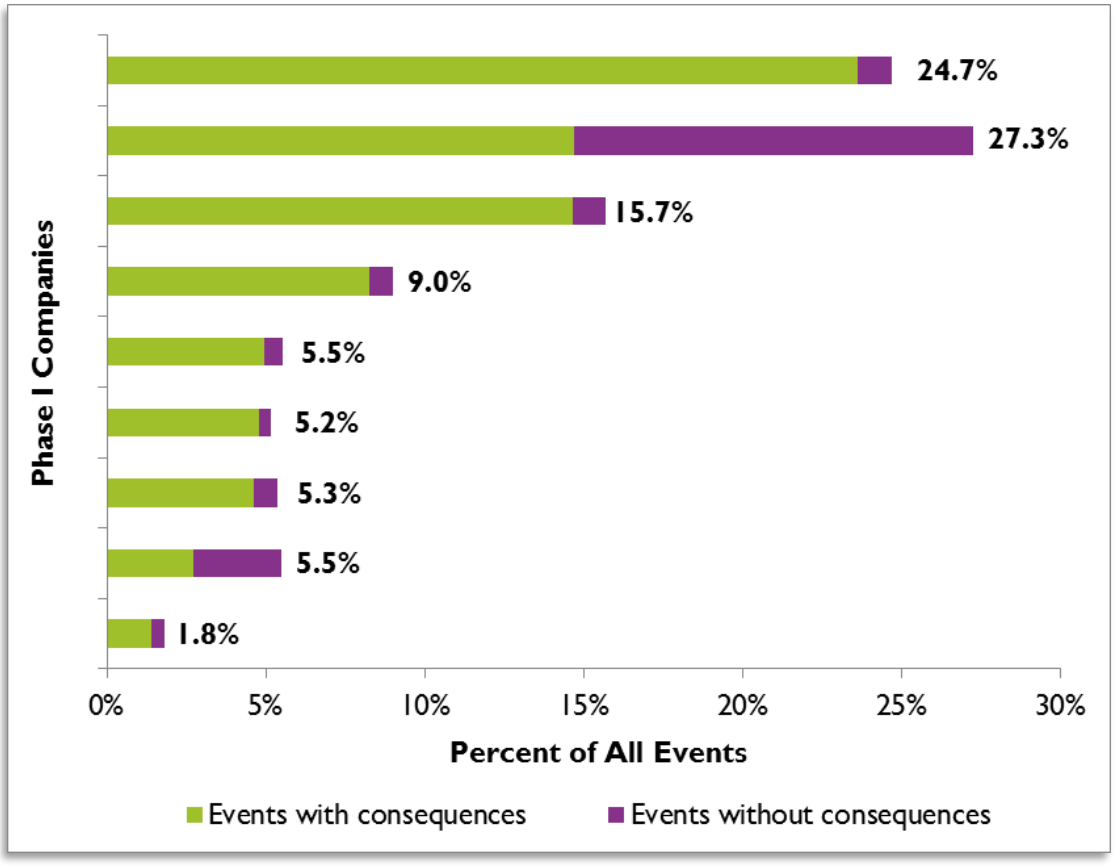
This analytical structure is intended to present results in a way that facilitates use by industry and other stakeholders to advance safety and environmental protection. With increased industry participation in SafeOCS ISD, a similar analysis of a larger and more representative dataset could highlight potential problem areas and best practices that could apply more broadly.

5 Data Analysis

5.1 All Events Summary

The Data Analysis section begins with a summary description of all safety events using core data fields, categories and characteristics. Of the 8,631 total events, there were 6,875 *events with consequences* and 1,757 *events without consequences*. Figure 8 shows the percentage of total events reported by each Phase I participating company. Two companies were responsible for a large portion of the dataset. This potential bias will likely be reduced as more companies submit data. There are two key points to keep in mind when reviewing the results: 1) only a portion of the events categorized as *event with consequences* were reportable to a regulatory agency and 2) variations in company-specific definitions of *event with consequences* could have resulted in similar events being classified differently.

Figure 8: Percent of Company Participation in Phase I by Event Type

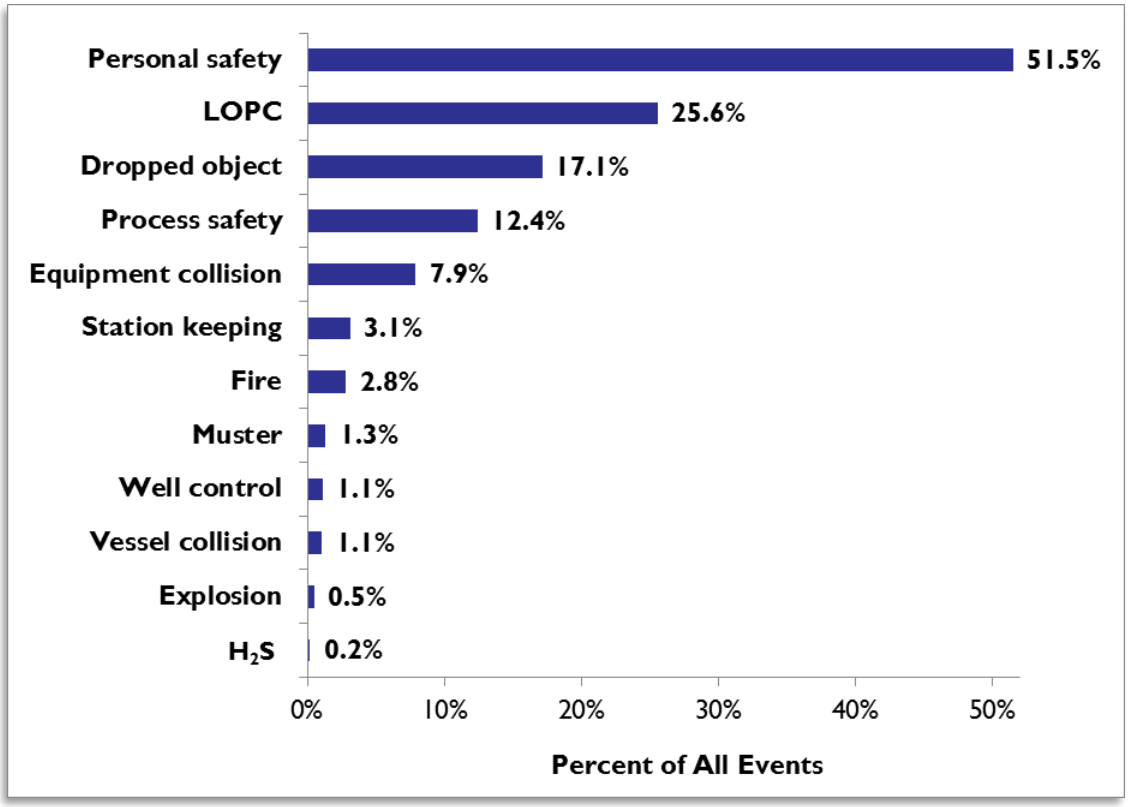


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 9 illustrates the types of events reported using the *event category* data field. The *personal safety* category was selected over 50 percent of the time to describe safety events. SafeOCS allowed companies to make multiple selections to describe events as appropriate since multiple event categories/attributes can be involved in a single event. As a result, the sum percentage of the individual categories exceeds 100 percent.

Events involving *collisions* were separated into two categories: 1) *vessel collision* for those involving marine or aviation vessels and 2) *equipment collision* for events involving objects striking equipment (e.g., a suspended load striking a handrail). It is important to note that dropped objects that land on the deck or strike equipment are not considered equipment collisions.

Figure 9: Phase I Data by Event Attributes



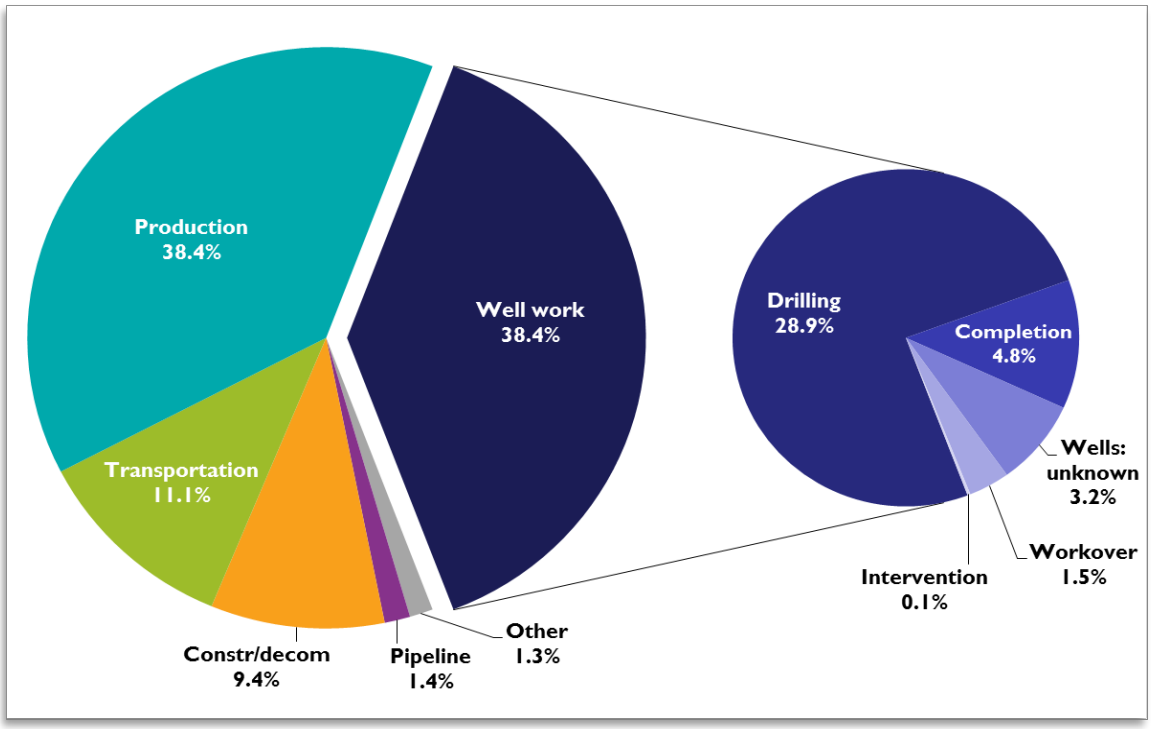
NOTE: Hydrogen sulfide (H_2S) is a colorless gas with a characteristic foul odor of rotten eggs. It is sometimes produced with and/or found in fluids from oil and gas drilling and production operations.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 10 shows the reported events by groups of related *operations*. Some operations were combined for ease of display. For example, *drilling*, *completion*, *workover*, *intervention*, and *plugging and abandonment* were combined into *well work*. Most of the reported events happened during *well work,* and more specifically, during drilling and *production* operations.

Transportation related events involved primarily crew and supply vessels and, to a lesser extent, helicopter landings and take offs.

Figure 10: Ongoing Operation When Event Occurred

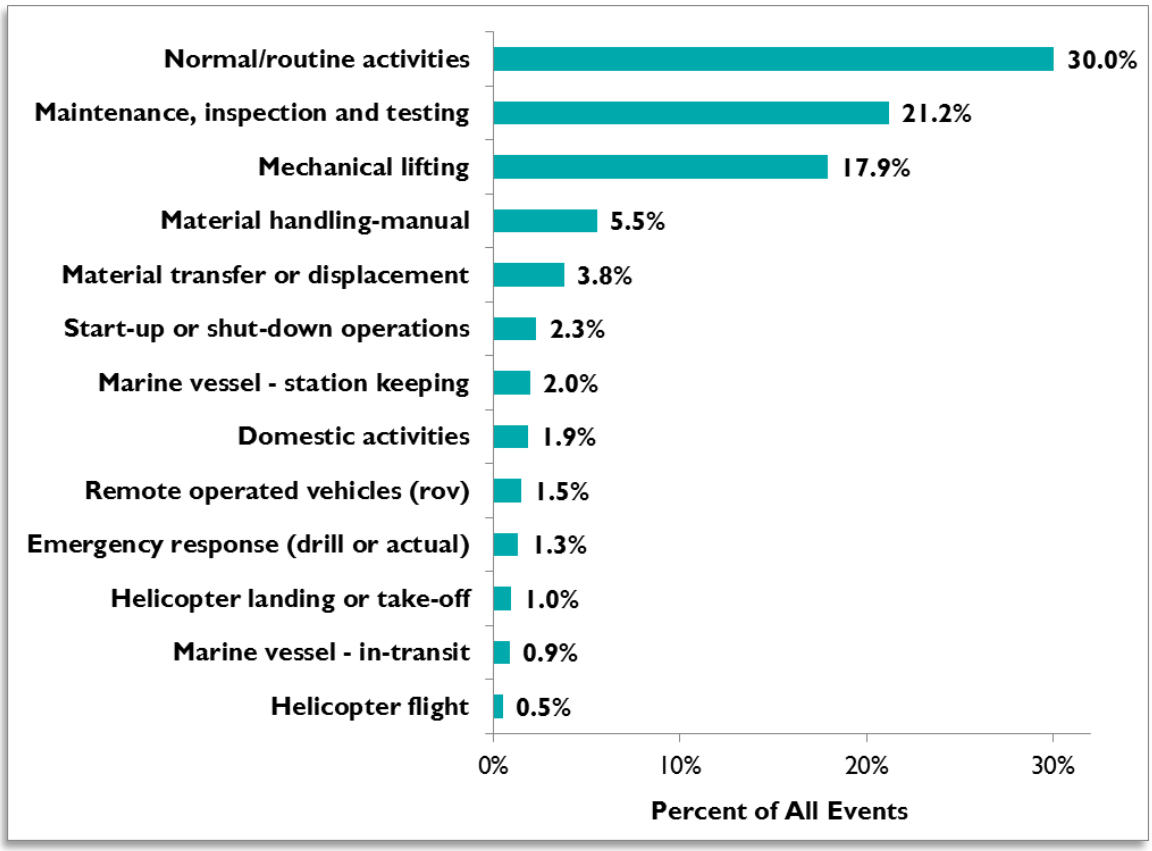


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 11 shows the breakdown of all events by the *primary activity* being performed at the time of the event. Events occurred most frequently during these activities: *normal/routine activities*; *maintenance, inspection, testing*; and *mechanical lifting*. Most events occurred during *normal/routine activities*; however, there isn't a standard definition of this activity across participants, which makes it difficult to classify events accurately.

For example, some companies may designate *mechanical lifting* as a *normal/routine activity*, rather than mechanical lifting. *Maintenance, inspection and testing, and mechanical lifting* activities are common across both *well* and *production* operations, which may explain the high percentage of events in those primary activities.

Figure 11: Primary Activity Underway When Event Occurred



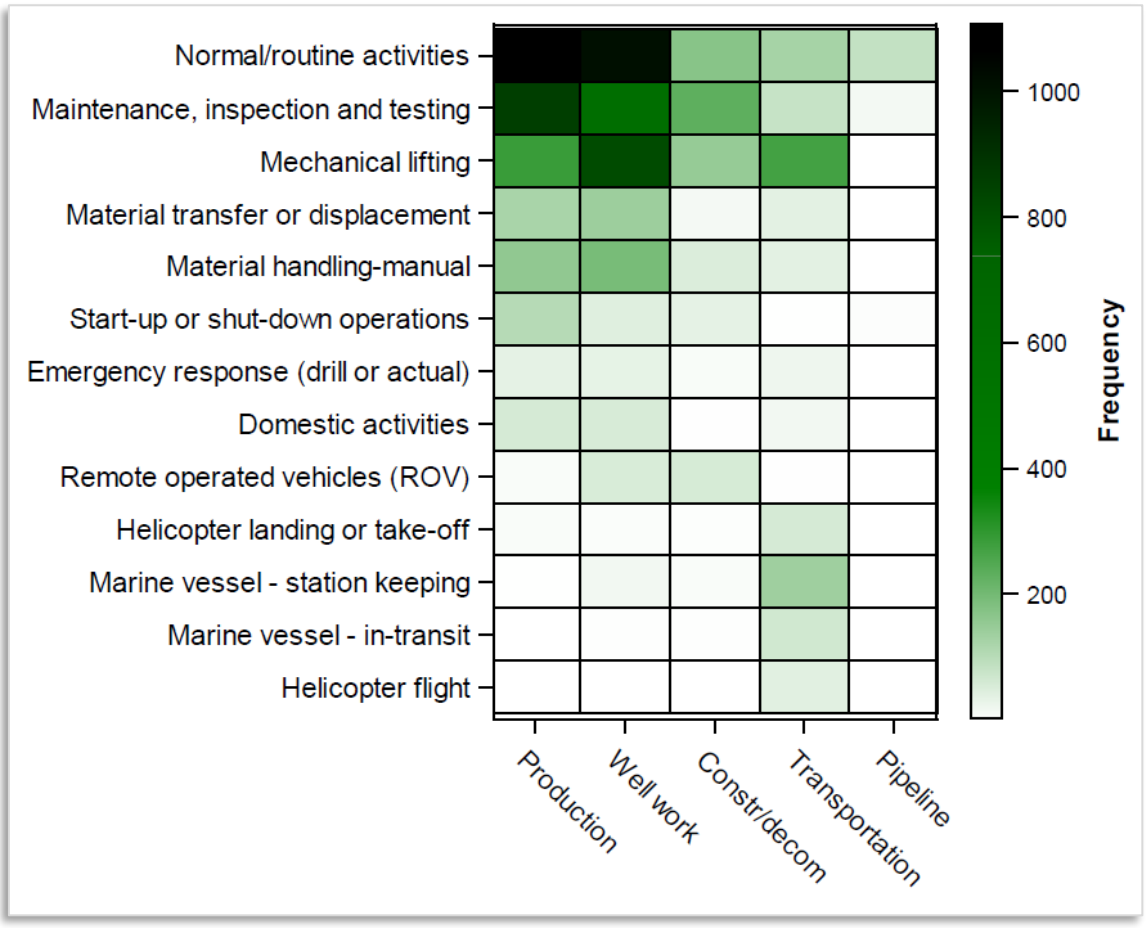
NOTE: Over 500 events (6.2 percent) were classified as unknown, either because there was insufficient information provided to properly classify the activity type, or the activity did not fit into the existing primary activity types. Fifty-eight percent of those were *events with consequences*. Thus, the incomplete data was a missed opportunity for a more complete analysis.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 12 is a heat map diagram that shows the relative frequency of events given the combination of two parameters: *primary activity type* and *operation group*. Heat maps can be useful in making observations about unexpected combinations of parameters. The higher the frequency, the more intense the color in the box that represents that combination. For example, events happening during *normal/routine activities* occurred most often during either *production* or *well work*.

Approximately 500 records were excluded from the chart because they either did not provide any information or listed *other* as the *primary activity* and/or *operation type*.

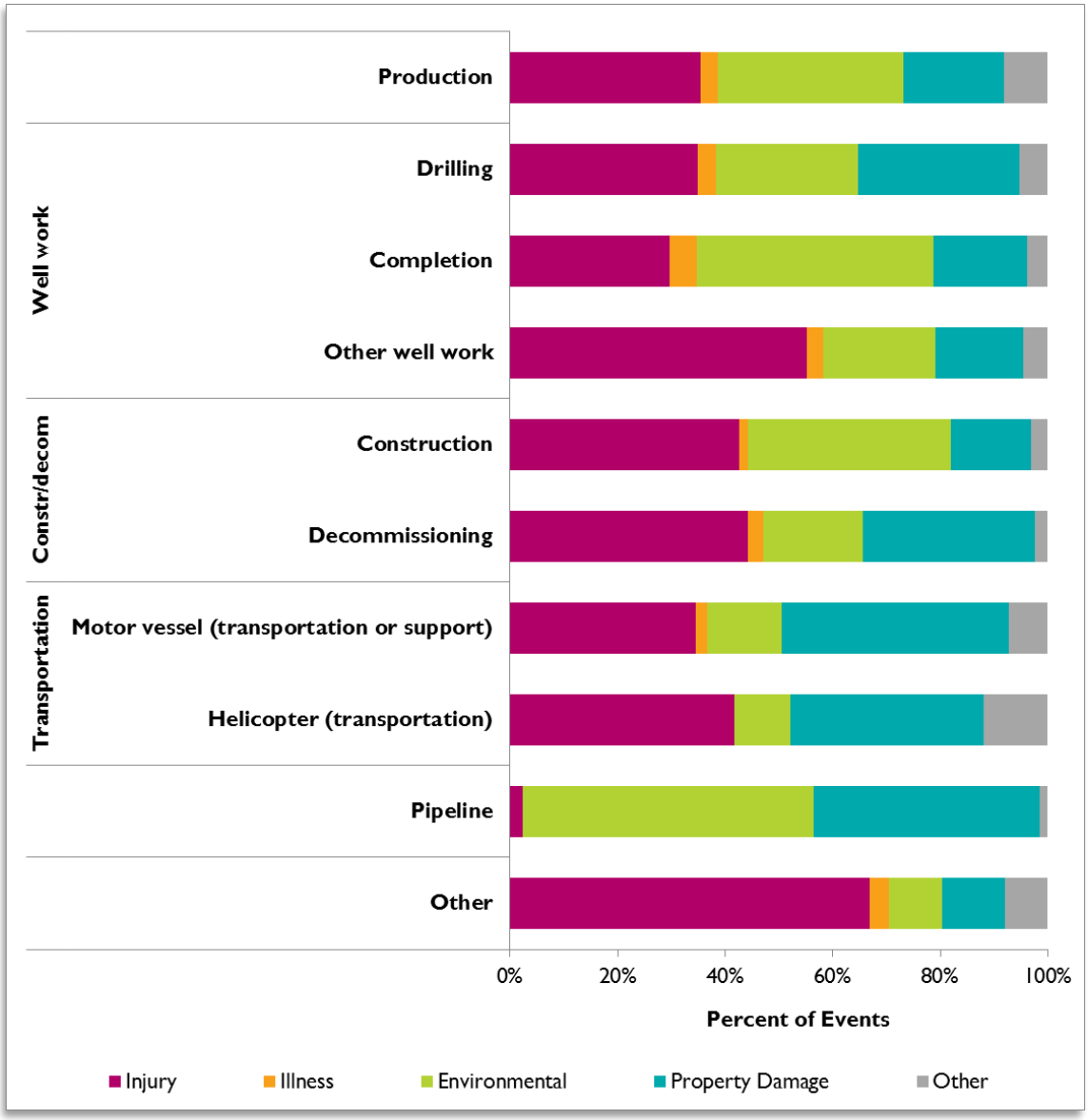
Figure 12: Primary Activity Type and Operation Group of All Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 13 illustrates the *consequences* of events by *operation group*. Each row shows the percent of events for the listed *operation* whose consequences were *injury*, *illness, environmental*, *property damage* or *other*. Submitters could assign multiple *consequences* to one event. Almost all operation types had a similar breakdown of *consequences*.

Figure 13: Actual Consequences by Operation Group



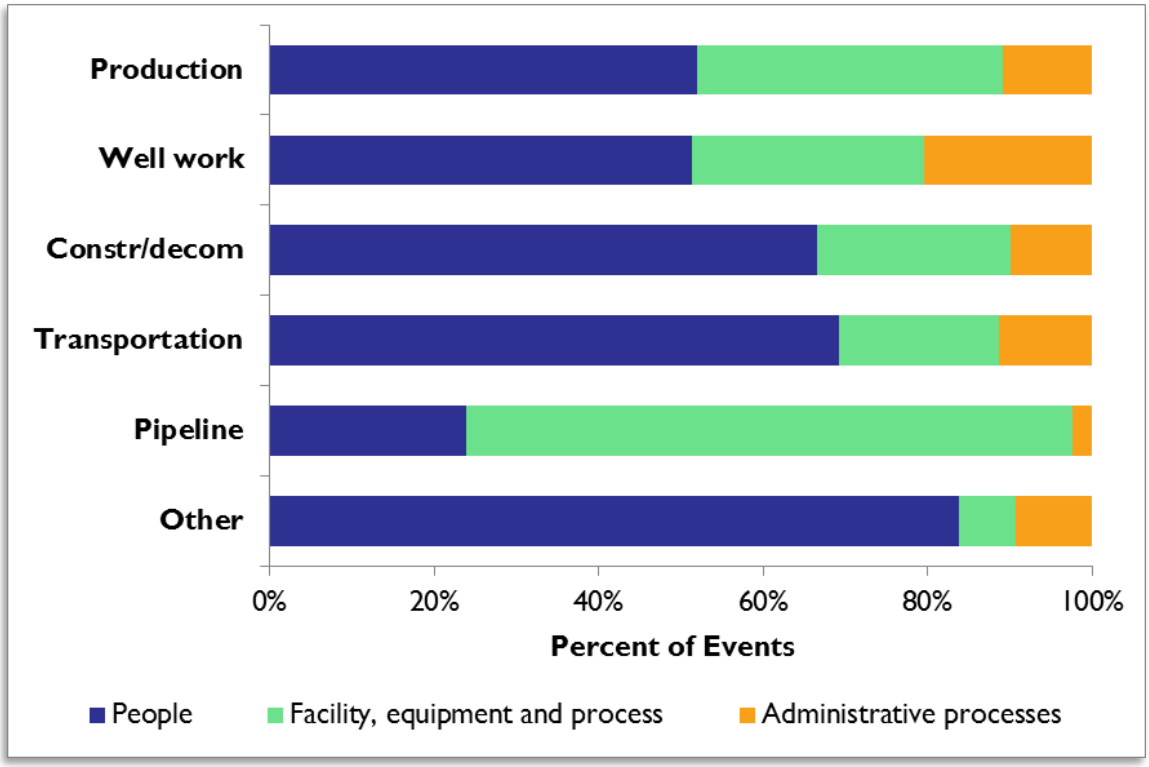
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Pipeline operations had very few injuries in this dataset, as pipeline operations may involve less human interaction, compared to other operation types. Records with designated *other* as the

operation primarily represent events for which the operation and asset type were both unknown and mostly involved minor injuries requiring only first aid. The *other well work* subcategory includes *workovers*, *interventions*, *abandonments*, *wireline work*, and *coil tubing work*.

Figure 14 breaks down events by the *causal factor* in each *operation group* for those that included one or more causal factors (75.0 percent). For causal factor definitions, see Appendix B. During Phase 1, unless a company provided multiple contributing causal factors, only one causal factor was assigned to each event, assuming sufficient information was available to make a causal factor determination.

Figure 14: Event Causal Factors by Operation Group

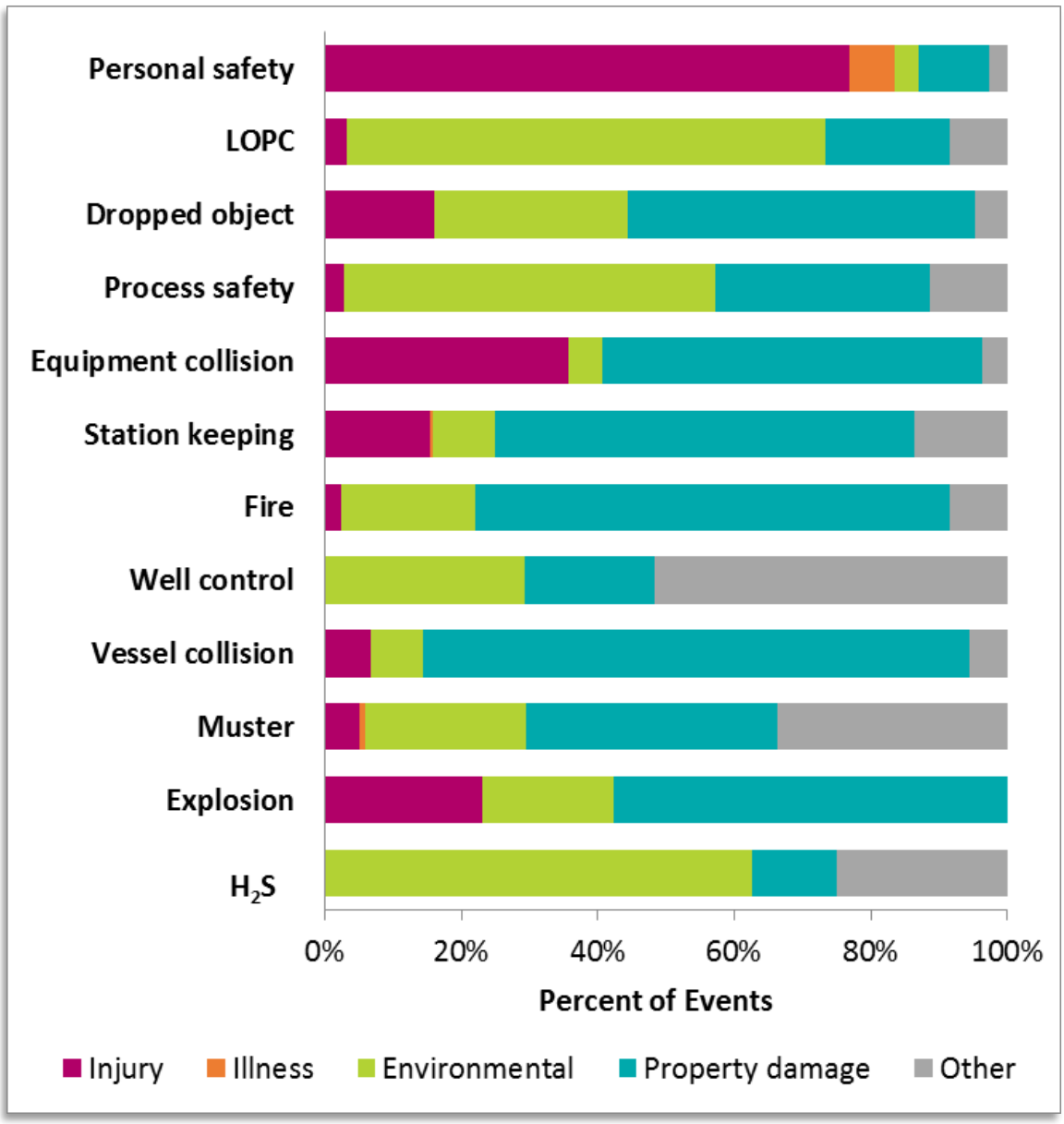


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

In cases where the data identified more than one causal factor, all of the factors noted were included in the analysis. *Administrative Processes* was the least identified causal factor in most cases. *People* was the most frequently identified causal factor across all operation groups, except pipeline, which is somewhat expected as pipeline operations have less human interaction compared to the other operations.

Figure 15 shows the *consequences* by *event attribute* in descending order by the number of events associated with each. *Personal safety*, *LOPC* and *dropped objects* are the three most frequently reported issues, accounting for 94.2 percent of all events.

Figure 15: Actual Consequences by Event Category



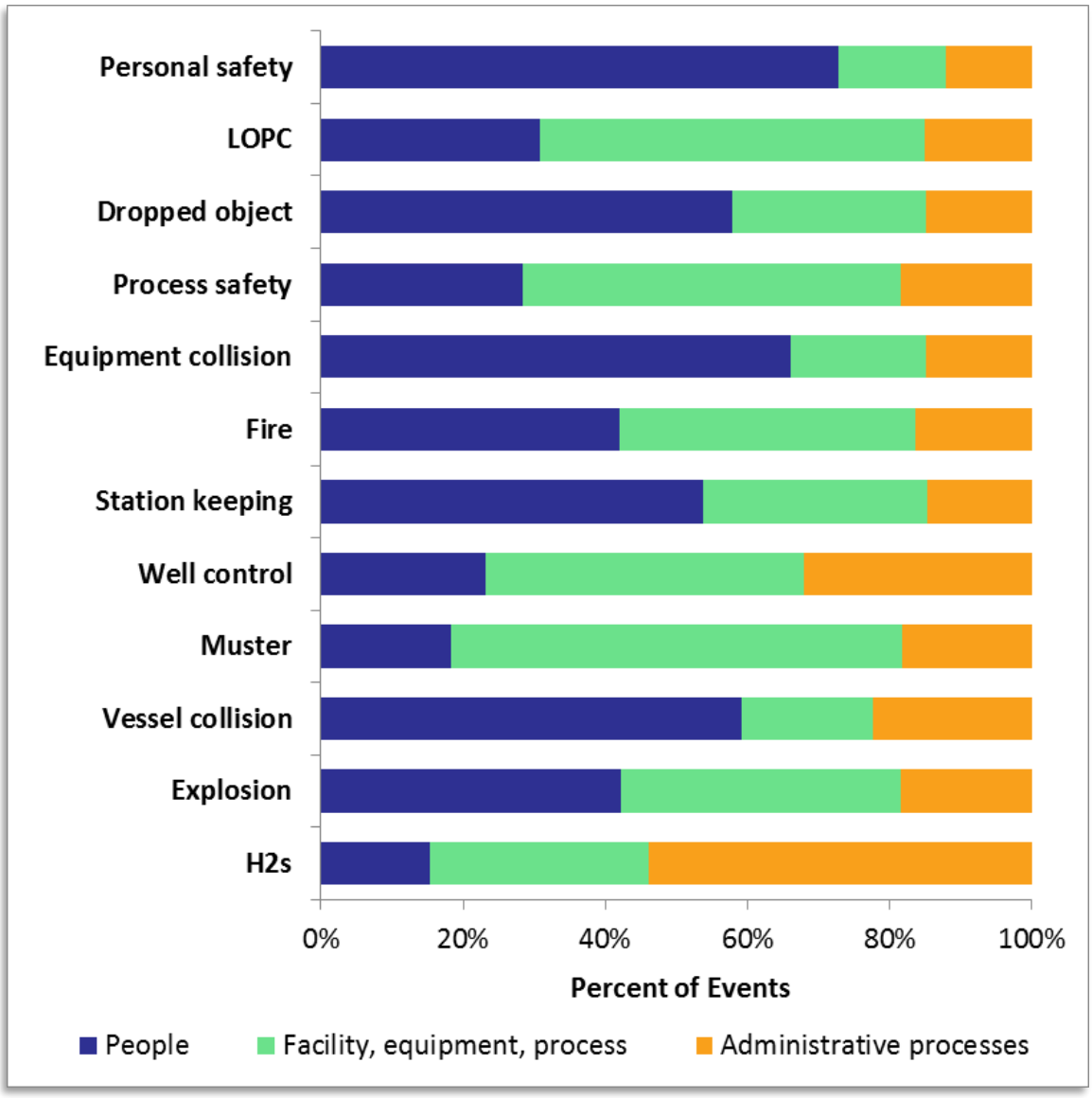
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Considering that each event can be defined by multiple categories and therefore appear more than once on this chart, the following observations can be supported by figure 15:

- *Personal safety* was mostly comprised of *injuries*, as expected.
- *LOPC* and *process safety* events, which often overlap, were dominated by *environmental* consequences.
- *Dropped objects* mostly resulted in *property damage*, but a substantial portion of them also resulted in *injury* or *environmental* consequences.
- *Equipment collision, fire, explosion, station keeping,* and *vessel collision* resulted mostly in *property damage*.
- *Illnesses* were reported with *station keeping* (sea sickness) and during a *muster* (physical weakness). However, there were very few events, accounting for an almost invisible sliver of each bar.
- I*njuries* were missing from *well control* events, as expected, but also from H_2S events.
- *Property damage* and *environmental* were consequences across all reported event issues. However, in many cases *property damage* was more frequent.

Figure 16 shows the *causal factor* breakdown by *event attributes*. The events related to *personal safety* were most commonly attributed to *people* related causes, and those associated with *process safety, muster*, and *LOPC* events were more *process* and *equipment* driven.

Figure 16: Causal Factors by Reported Event Attribute

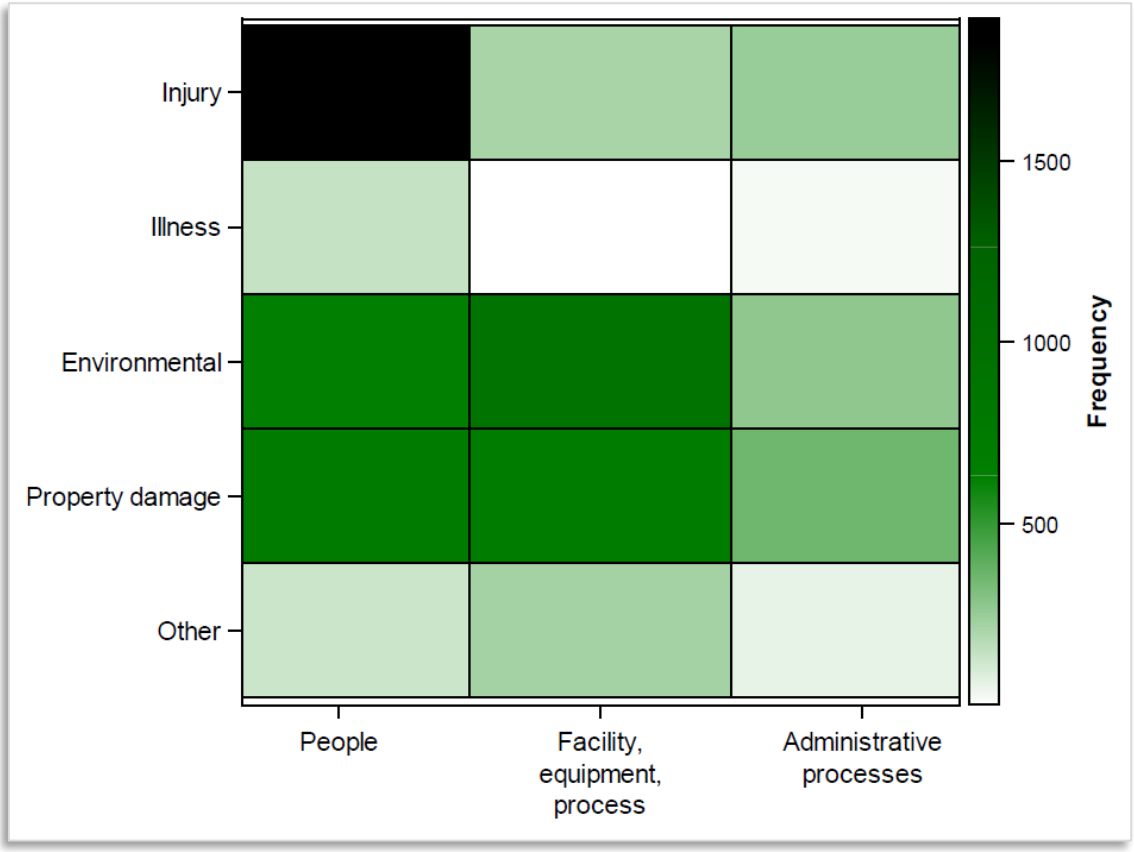


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

The dataset also showed that equipment reliability issues (e.g., leaks) were responsible for the high percentage of equipment related events in the *LOPC* category. Further breakdown of the causal factors by *consequence* is discussed in the following sections.

Figure 17 shows a heat map of the aggregate *causal factor* frequency for each type of *consequence*. It reveals that *environmental* related events were mostly attributed to the *physical facility, equipment, and process*.

Figure 17: Causal Factors and Actual Consequences for Reported Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

It also shows that *people* related causal factors led most frequently to *injuries* (over other consequences) and were less of a causal factor in *environmental* related events.

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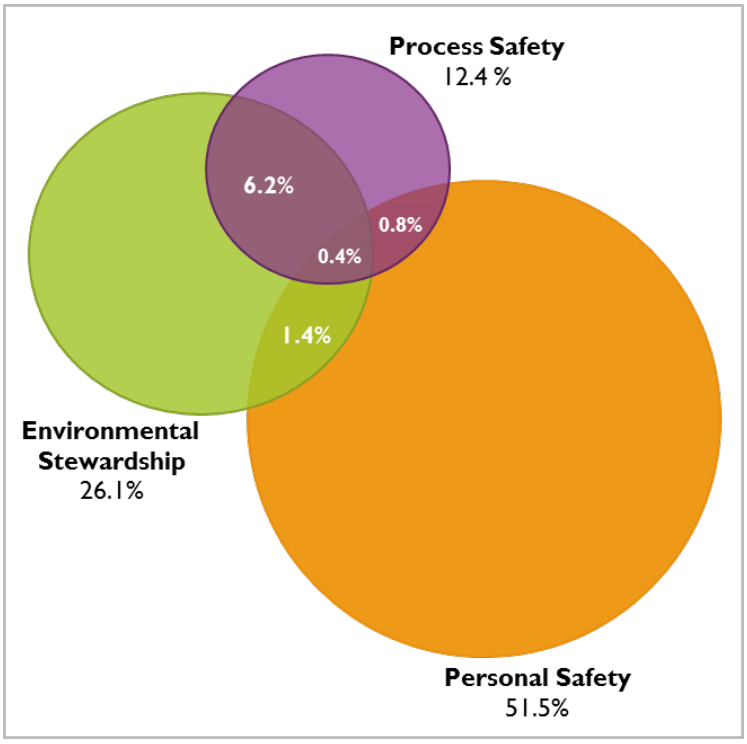
5.2 PROCESS SAFETY, PERSONAL SAFETY, OR ENVIRONMENTAL STEWARDSHIP

The remainder of the *Data Analysis* section will focus on events classified within three focus areas: *process safety*, *personal safety*, or *environmental stewardship*. These classifications are based on *event attributes*, as well as other characteristics of the event. As previously noted, an event can have multiple associations depending on the circumstances. For example, a leak of natural gas would be classified both as a process safety event and an environmental stewardship event. If the same gas release also resulted in an injury, it would also be classified as a personal safety event.

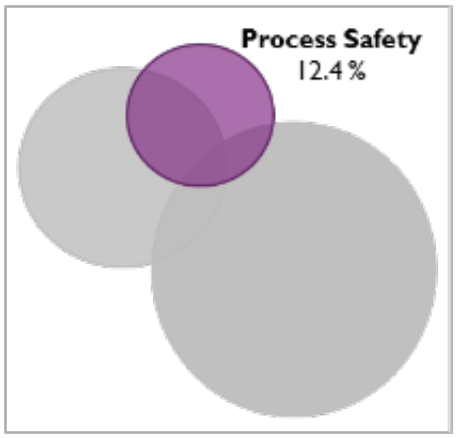
Figure 18: Overlap of Reported Events by Focus Area



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 18 details the overlap between these three focus areas (classifications) and the percentages shown are representative of the total events. For example, 0.8 percent of the events were categorized as both *personal safety* and *process safety*. The section for each focus area includes all reported events associated with that focus area, even those which overlap with another. However, only the applicable aspects of the event will be discussed in the designated section. For example, for those events considered both personal safety and environmental stewardship, the personal safety factors of the event will be discussed in the personal safety section and the environmental factors in the environmental stewardship section. The sections are discussed in the following order: 1) *process safety*, 2) *personal safety*, and 3) *environmental stewardship*.

PROCESS SAFETY

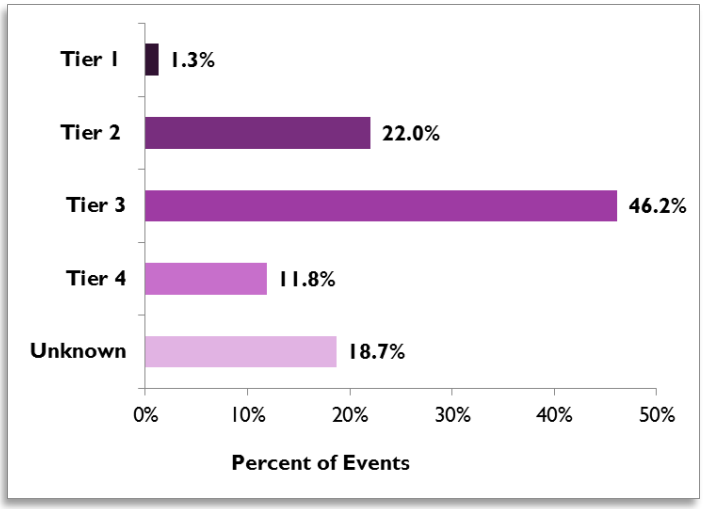


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Of the total 8,631 events, 1,072 were considered *process safety events* (PSEs). Process Safety events involve the prevention and control of potential releases of hazardous materials or energy. Although *loss of primary containment* (LOPC) events could also result in a process safety hazard, it should be noted that not all LOPC events are PSEs.

The severity of a process safety event is indicated by its Tier level, with Tier 1 being the most serious.[12] Tier 2 events are PSEs with lesser consequence than Tier 1. Tier 3 and Tier 4 events are those that involve near-misses, place demands on the safety system, and have LOPCs with volumes less than the defined Tier 1 or Tier 2 quantity for the released substance. For example, an event where a pressure relief valve opens to prevent equipment overpressure is considered a Tier 3 PSE. Additionally, an event where the equipment's safe operating range has been exceeded, such as reaching the high temperature limit on a gas compressor, is a Tier 3 event. Tier 4 PSEs are associated with safety management systems or operating procedures. An example of a Tier 4 event might be an audit finding

Figure 19: Tier Level Severity of Process Safety Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

[12] Int'l Assoc. of Oil & Gas Producers, Process safety – Recommended practice on Key Performance Indicators, Report No. 456, Nov. 2018

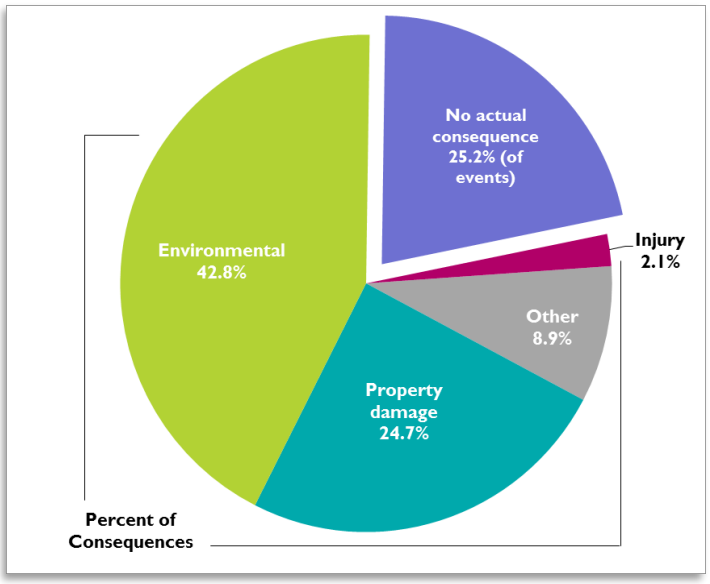
indicating a safety device was not tested within the required time period. See Appendix C under Process Safety Event for more detailed Tier definitions.

Figure 19 demonstrates the distribution of Tier levels for all of the events involving process safety. This chart is based on data or event descriptions provided by companies and are consistent with the process safety tier level definitions established in the International Association of Oil & Gas Producers (IOGP) 456.[13] Not enough information was provided to assess the Tier level for those labeled *unknown*. Slightly over one percent of process safety events were labeled as Tier 1, the most serious level.

Consequences for Reported Process Safety Events

Figure 20 demonstrates the consequences of reported process safety events. The most common consequence, at 42.8 percent, was environmental, which was reported on most LOPCs followed by property damage at 24.7 percent. The remaining *other* consequences include efficiency or financial consequences such as operational upsets - *operations requiring additional equipment maintenance or inspection*. Although the percentage of reported injuries is relatively low (2.1 percent), six of the reported injuries associated with process safety events were very serious (5 lost time injuries and 1 fatality).

Figure 20: Consequences of Process Safety Events



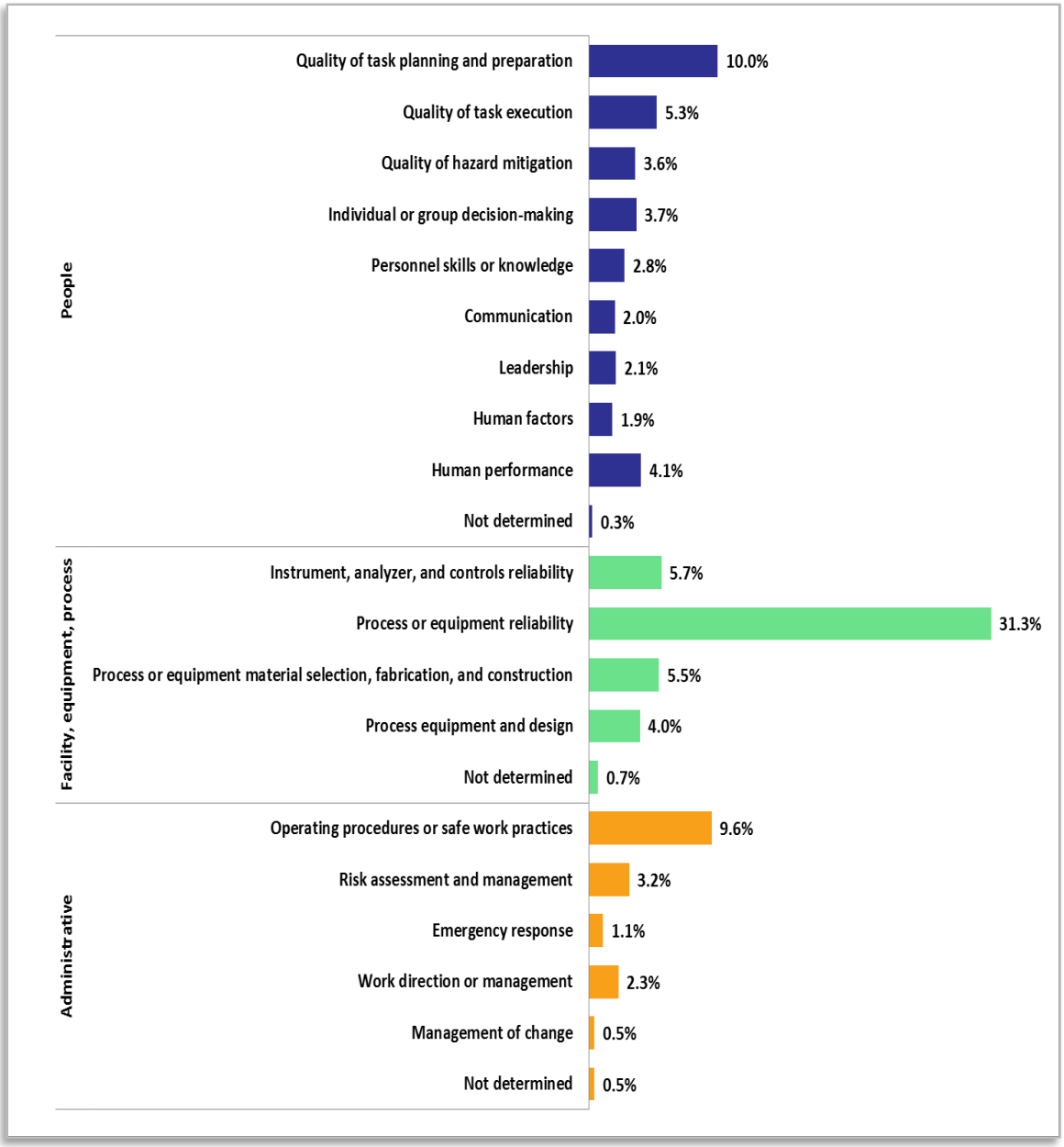
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

[13] Int'l Assoc. of Oil & Gas Producers, Process safety – Recommended practice on Key Performance Indicators, Report No. 456, Nov. 2018

Causal Factors for Reported Process Safety Events

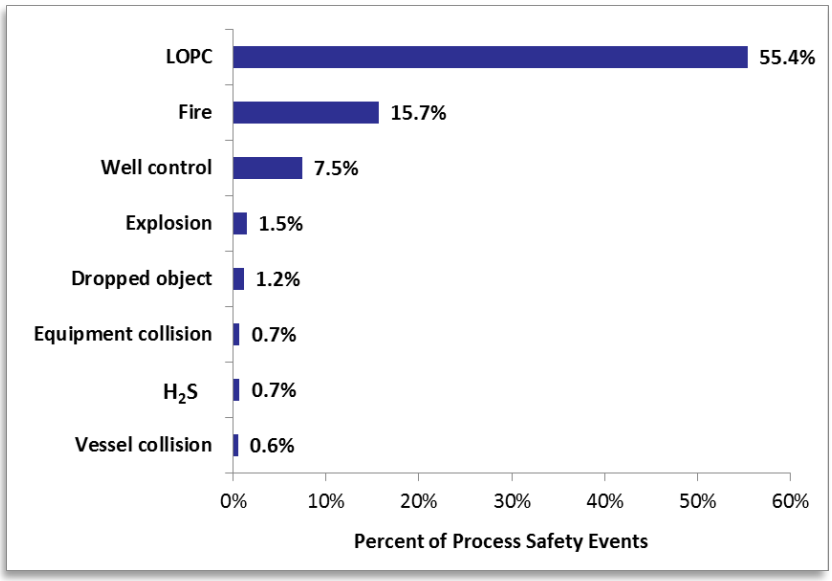
Over 76.5 percent of PSEs provided sufficient information on causal factors. *Process or equipment reliability* was the most commonly identified causal factor. *Human factors* and other less identified causal factors may be more prevalent in an analysis allowing for the selection of multiple causal factors per event. Figure 21 breaks down the main causal factors - *administrative*, *people*, and *facility, equipment, process* - of the reported PSEs by sub factor.

Figure 21: Causal Factors of Process Safety Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 22: Additional Attributes Associated with Process Safety Events



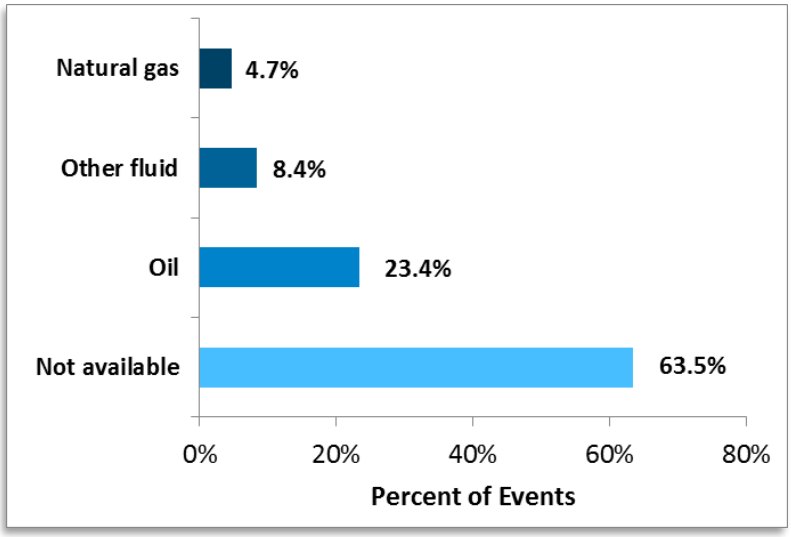
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Approximately one-fifth of *process safety* events were not associated with any other event attribute. Figure 22 shows the percentage of PSEs associated with one or more event categories in addition to *process safety*.

Process Safety Events Involving Fluid Release

Approximately 55 percent of process safety events involved some type of *fluid release* and were also labeled as *LOPC*. Figure 23 illustrates the breakdown of these events into leaks of *natural gas, oil,* and *other fluids* (chemicals, control fluids, etc.). Some releases involved natural gas released to the air, while others involved oil that could have had environmental risks; both types of releases are discussed further in the *environmental stewardship* section.

Figure 23: Fluid Released in Process Safety Events Involving LOPC

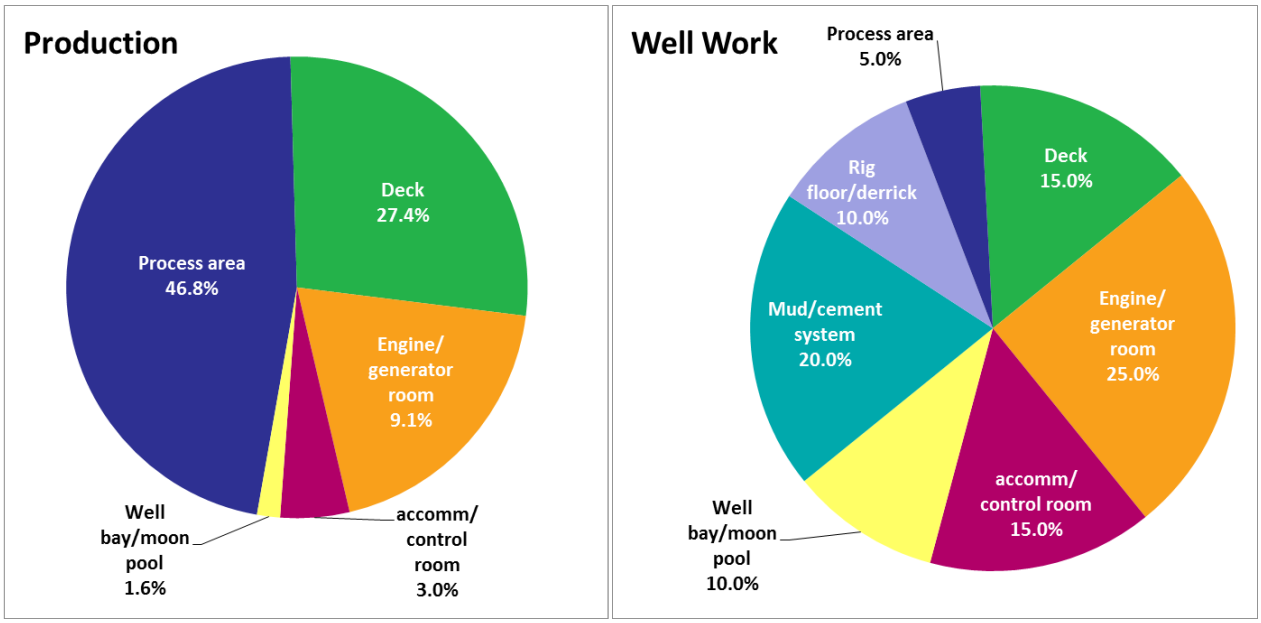


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Process Safety Events Involving Fire

About 16 percent of PSEs were also associated with the presence of fire, primarily during production or well work operations. Figure 24 shows the breakdown of location on the facility for reported fires in production or well work operations.

Figure 24: Location of Events Involving Fire



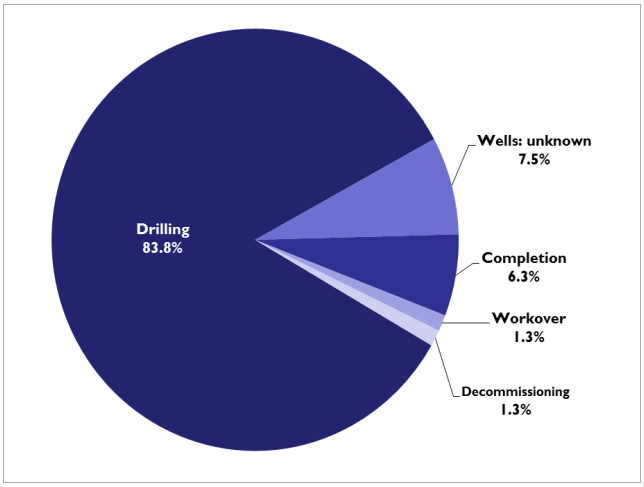
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

These fires were mostly in areas containing well fluids such as the *process area*, *cement/mud system*, and the *well bay*. Fires in *engine/generator* rooms on both production and well work operations were mostly caused by insulation igniting on exhaust manifolds.

Process Safety Events Involving Well Control

Of all PSEs, 7.5 percent involved *well control* events. Only one of those events occurred outside of well work, and the majority (83.8 percent) occurred during *drilling*, as shown in figure 25.

Figure 25: Operation Type of PSEs Involving Well Control

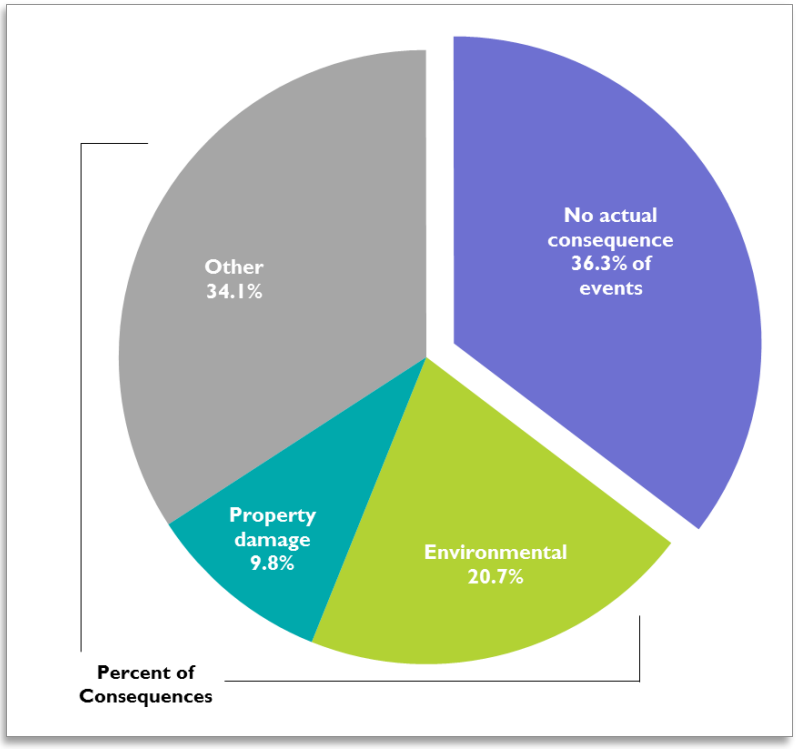


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 26 demonstrates the breakdown of *consequences* for process safety events associated with *well control*. The most frequent consequences of these events were *environmental* and *property damage*. Over 35.0 percent of the events had no consequences, indicating that the event was successfully managed with minimal impact to people or the environment. Approximately 34 percent of the consequences of *well control* events were labeled *other* consequences, which include additional operational effort or maintenance on the equipment. A summary of these events is provided below:

- About half of PSE events involved unexpected fluid gains (aka *a kick*) from the well. When this occurs, the well is temporarily shut-in (closed off) to manage the influx from the well formation using drilling mud and/or other circulating operations. The consequence of these extra operations was *non-productive time* for the rig.
- The remaining events required that normal operations be suspended temporarily to perform troubleshooting or maintenance on the equipment. These are often considered operating efficiency or financial consequences.

Figure 26: Consequences of PSEs Involving Well Control



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Process Safety Events Involving Explosion

One and a half percent of the PSEs also involved *explosions*, which can be actual or potential, and involve the sudden release of pressure (or energy) of any substance – not just flammable

materials. Approximately 75 percent of reported process safety events involving explosions were not accompanied by fire, and less than half of these events did not involve hydrocarbons. The events that involved explosion without fire (i.e., overpressure) are discussed in the P*ersonal Safety* section.

Process Safety Events Involving Dropped Objects

Special care is taken when lifting items over any process equipment because of potential process safety consequences resulting from a *dropped object*. In Phase 1, less than 2.0 percent of the events involving actual or potential dropped objects were also indicated as *process safety events*, meaning the process equipment could have been impacted or affected. Nearly all reported *dropped object* events (>98 percent) were considered *non-process safety* events. Dropped objects are more frequently associated with *personal safety*, and they are discussed further in that section.

Process Safety Events Involving Equipment Collision

In addition to *dropped objects* that collide with other equipment, events where equipment collisions impacted process equipment are equally important in affecting process safety. Several such records were present in the ISD database. Similar to dropped objects, equipment in motion (being lifted or moved) can strike stationary process equipment and result in damage. Based on information from the current ISD dataset, there is a potential for equipment collisions to involve process equipment and result in actual consequences such as LOPCs, including gas releases. *Equipment collisions* are discussed further in the *Personal Safety* section.

Process Safety Events Involving Hydrogen Sulfide

Less than one percent of the PSEs also involved *hydrogen sulfide* gas (H_2S), which is a toxic poisonous gas sometimes produced with and/or found in fluids from oil and gas wells. In a few of these cases, a *muster* and/or *evacuation* of the facility was ordered. Most of the cases were related to fluids from wells during well work, but a few of the events occurred when trace amounts of H_2S were created due to a chemical reaction in a storage tank.

Process Safety Events Involving Vessel Collision

In addition to *equipment collision*, *vessel collisions* have the potential to lead to *process safety* events. The *loss of station keeping* on a marine vessel can lead to a vessel colliding with a rig or production facility or the process equipment (riser, etc.) that is between the sea floor and that structure. Six PSEs involved collision and had consequences; however, none of them had a loss of containment of the process fluids.

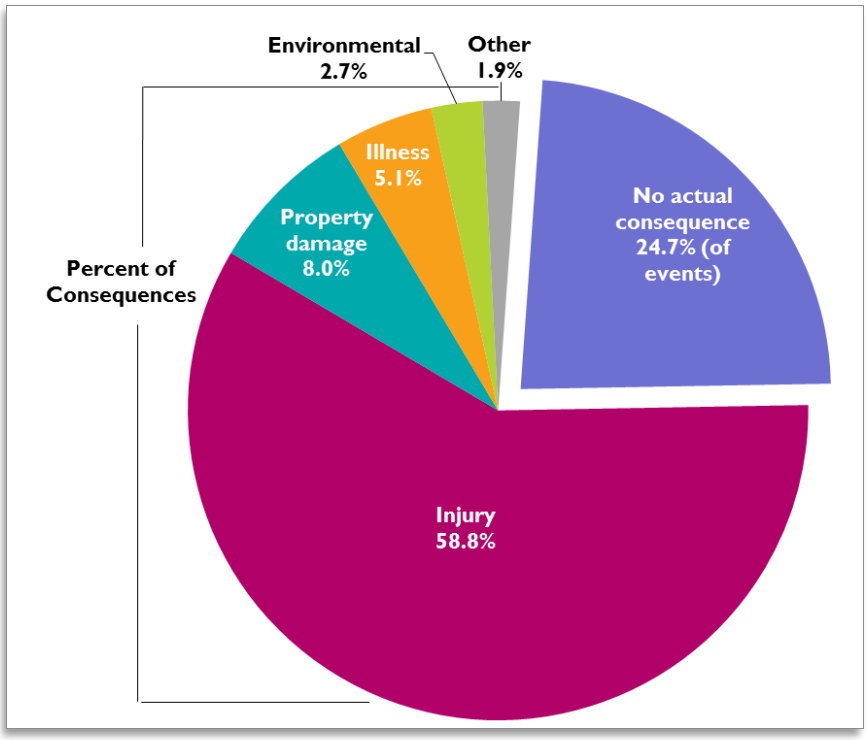
PERSONAL SAFETY

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Of the total 8,631 events, 4,448 (51.5 percent) involved *personal safety* where activities presented a risk of *injury* or *illness*. Very few events (0.8 percent of total) involved both *personal safety* and *process safety*. The *personal safety* aspects of the overlapping events are included in the analysis below, which considers both *events with consequences* as well as *events without consequences*. The latter can include *leading indicators* of unsafe events.

Figure 27 shows the percentage of actual *consequences* associated with *personal safety events*. As expected, the majority of the reported consequences were *injury* or *illness*. In addition, over 10 percent of the reported cases involved *property damage* or *environmental*. Nearly one quarter of the events had no consequences and were mostly cases that require either no treatment or first aid only.

Figure 27: Consequences of Personal Safety Events



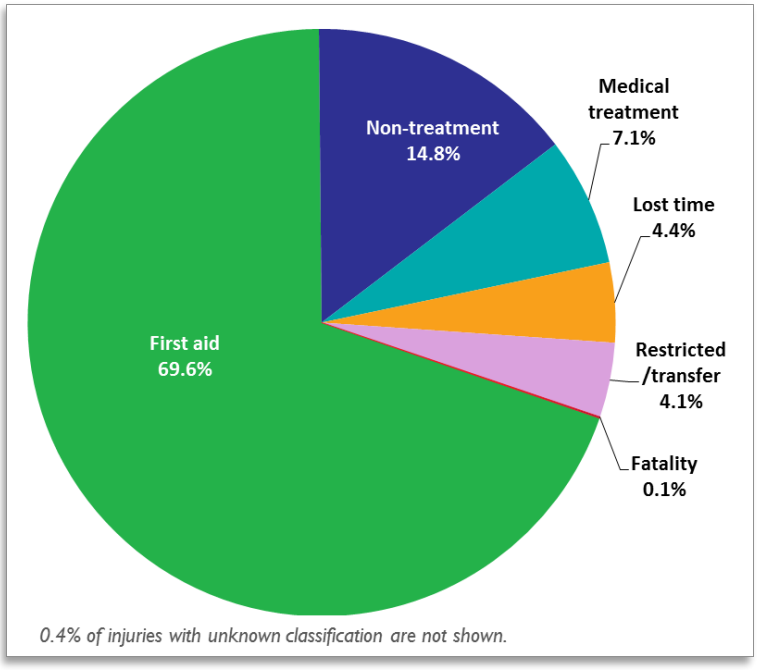
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Injuries

As seen in figure 28, almost 85 percent of the *injuries* required *no treatment* or only required basic *first aid*. The remainder of the injuries (15.7 percent) had more serious consequences, including two *fatalities*.

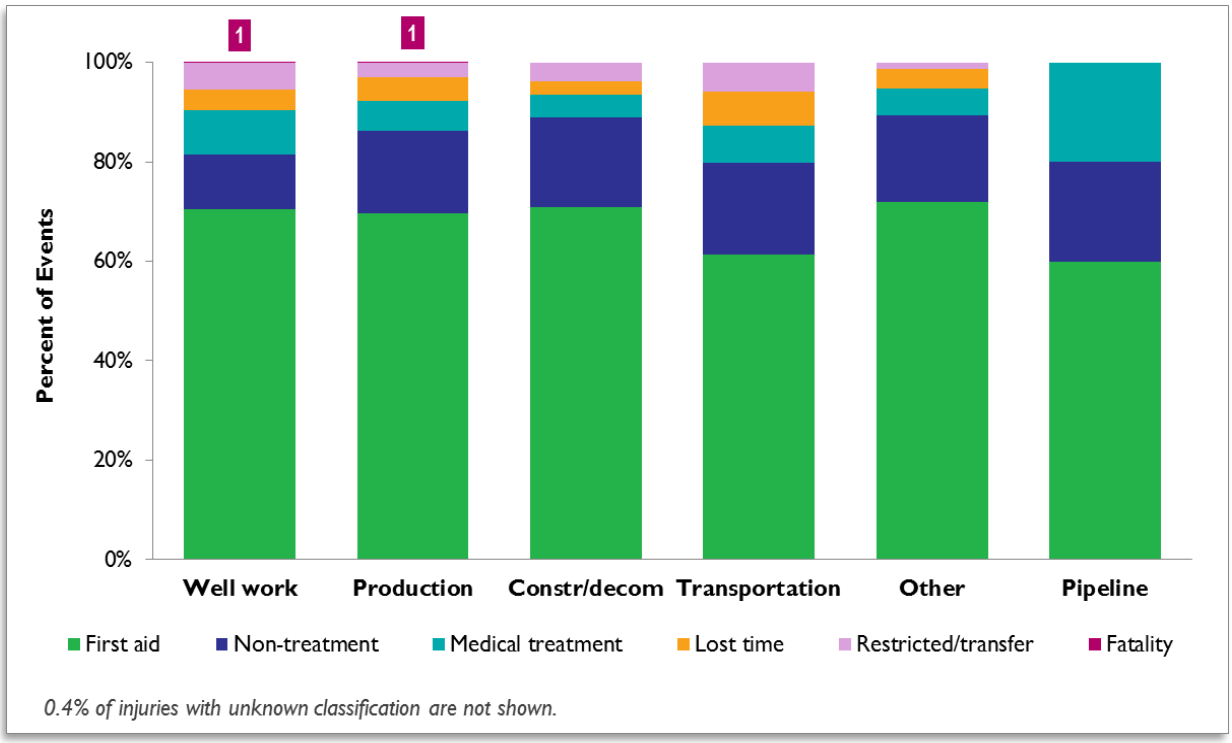
Figure 29 shows the *injury classifications* for each *operation group*. *First aid* and *non-treatment* cases were the most frequent classification for all operation groups (70 – 90 percent of each group).

Figure 28: Injury Classification in Personal Safety Events Recorded as Injuries



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

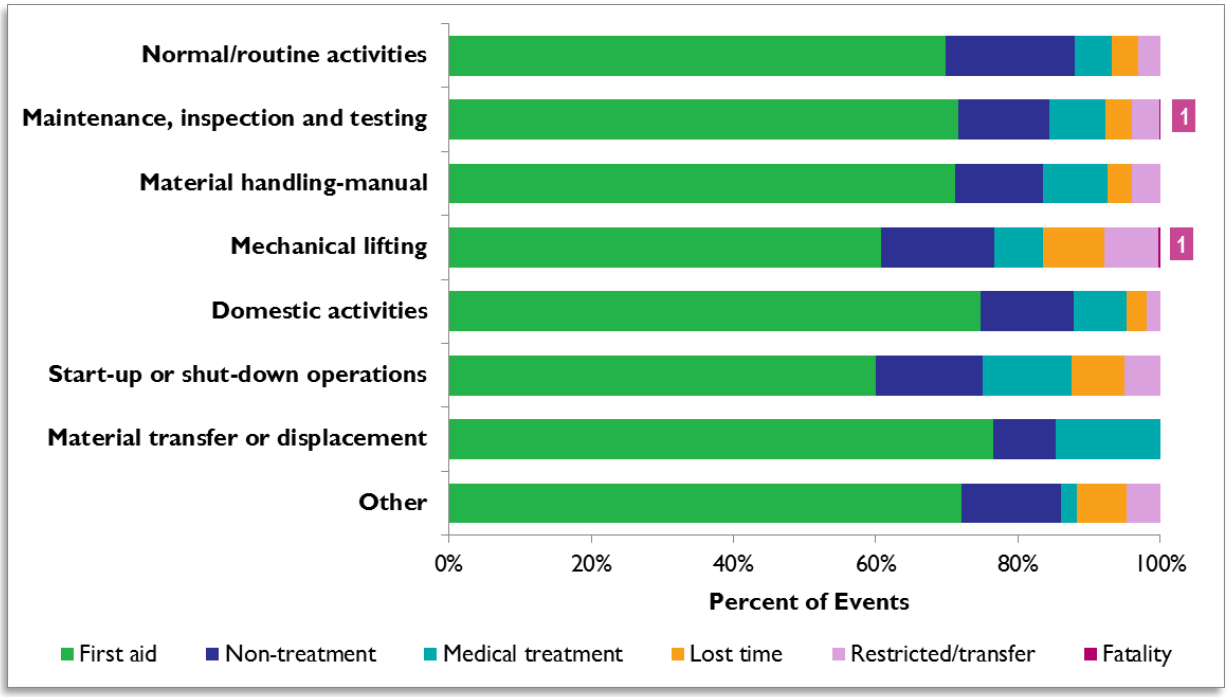
Figure 29: Injury Classification by Operation Group



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 30 shows *injuries* by their *severity classification* for each *primary activity* type. This arrangement, if representative, may reveal the activity types that are more susceptible to serious injuries. *Mechanical lifting* and *start-up or shut down* operations had a higher percentage of *lost time* events than any of the other primary activities.

Figure 30: Injury Classification by Primary Activity Type

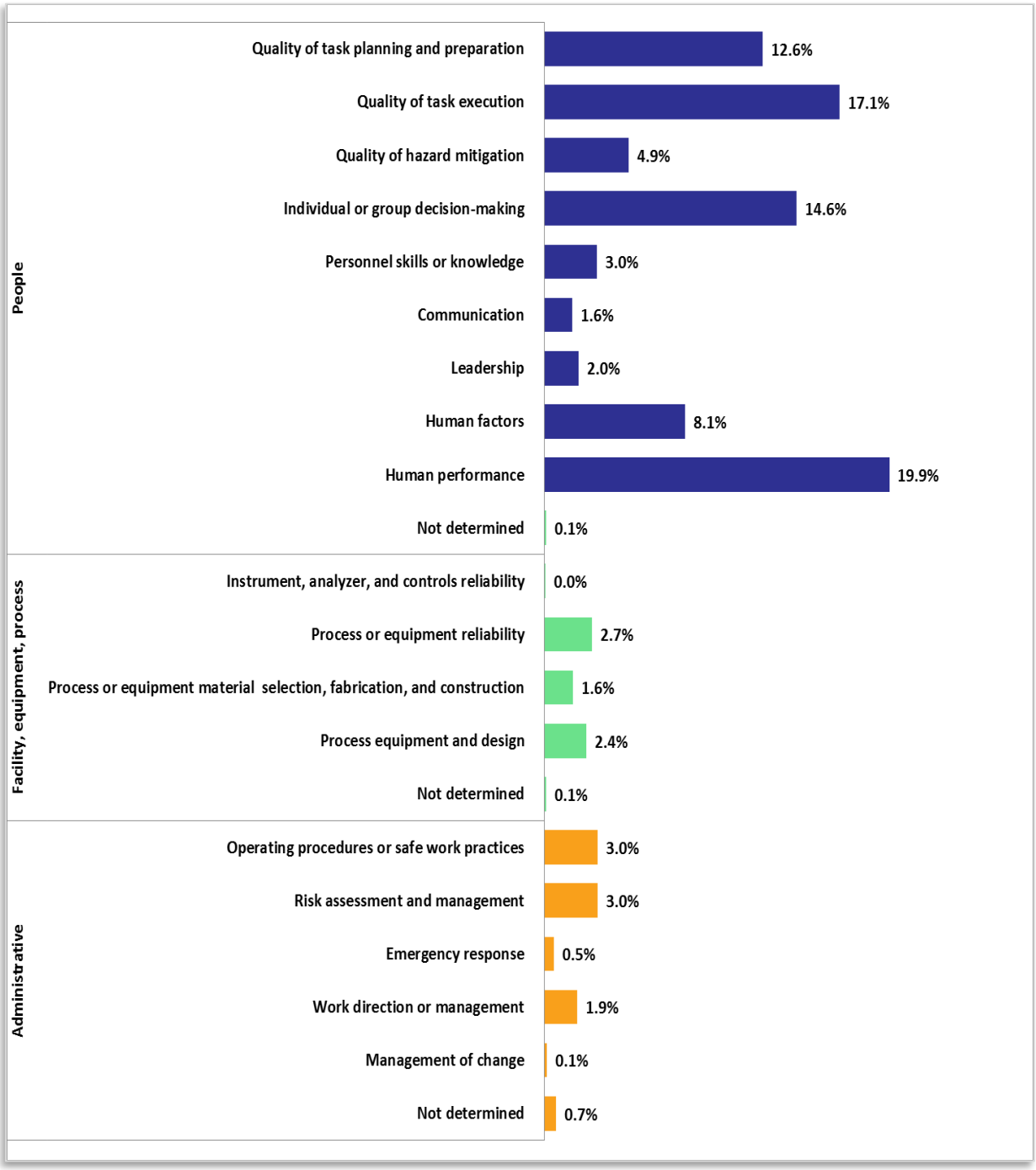


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Note that the two listed fatalities occurred during two of the top four most frequently conducted activities – *mechanical lifting* (in drilling operations) and *maintenance activities*. The *other* category, which represents about 7 percent of all injury events, includes transportation related injuries (<2 percent), unknown primary activity (3 percent), and other activities that did not fit into any of the listed primary activities.

Nearly 80 percent of reports with actual *injuries* provided sufficient information to indicate the *causal factor*. As shown in figure 31, *people-related* causal factors were the most common when injuries occurred.

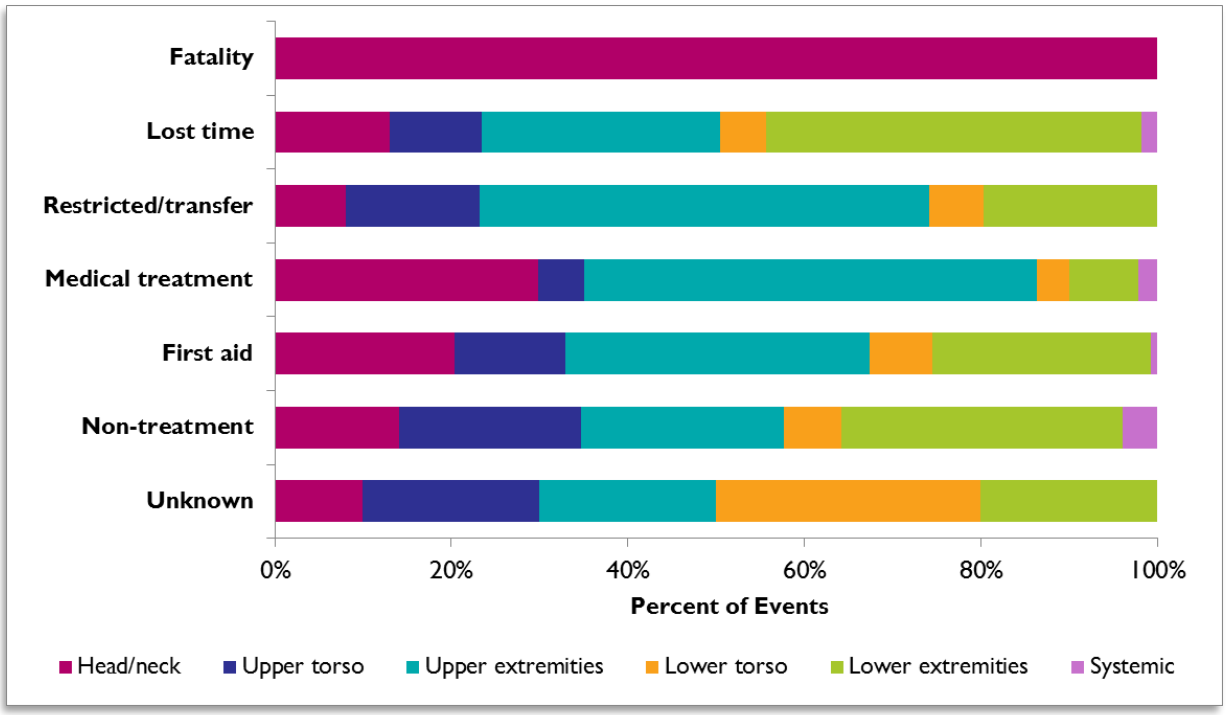
Figure 31: Causal Factors of Events with Reported Injuries



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 32 breaks down the *injured body part* for each *injury classification*. A higher percentage of the injuries that resulted in *lost time* involved the *lower extremities*, as compared to any other injury classification. The *systemic* body part category includes illnesses or injuries that impact the entire body, such as heat related illness.

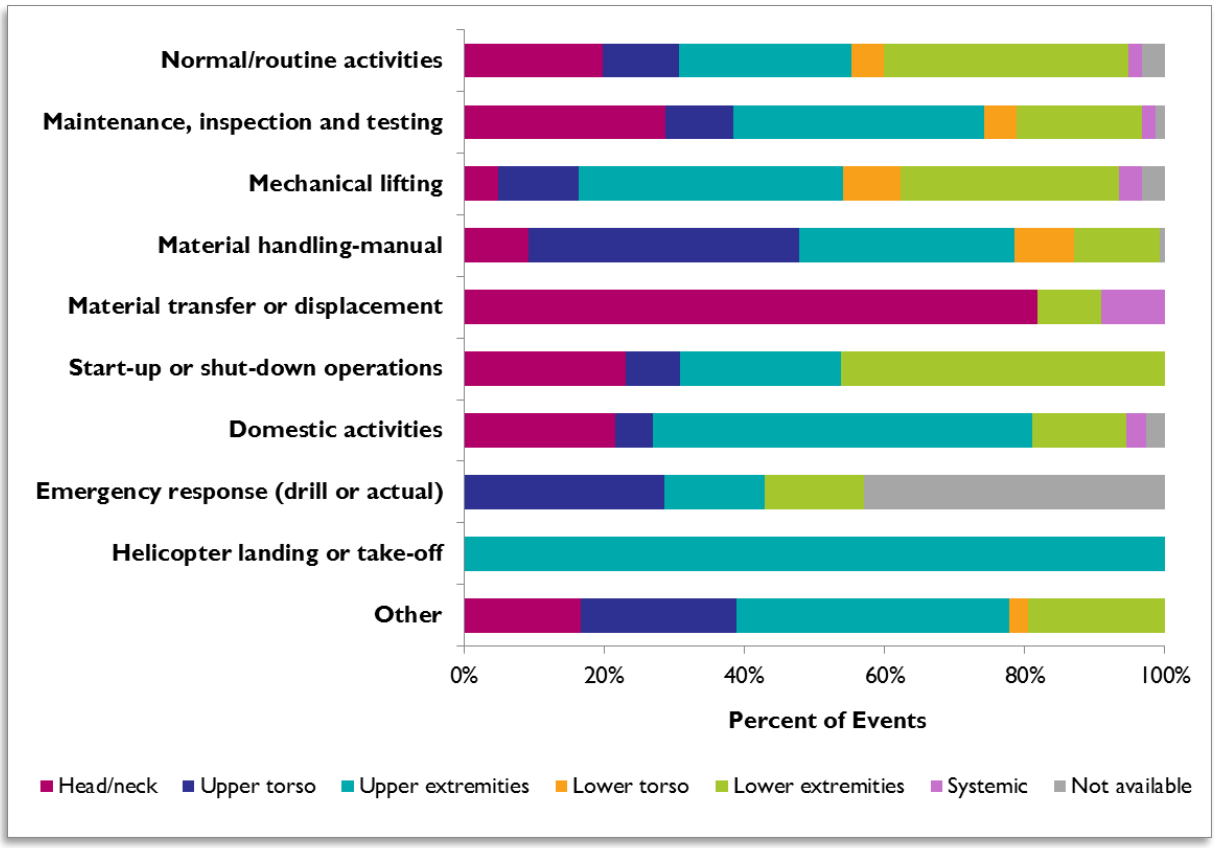
Figure 32: Details on Injury Events by Injury Classification



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Figure 33 shows the distribution of *body parts injured* across the *primary activities* happening during *production*. *Helicopter landing and take-off* activities were associated with injury to *lower extremities* only. This result can be partially attributed to the small number of helicopter transport related events found in the database. *Head/neck* injuries make up the largest portion of reported injuries associated with events involving *material transfer and displacement*.

Figure 33: Details on Injuries during Production by Primary Activity

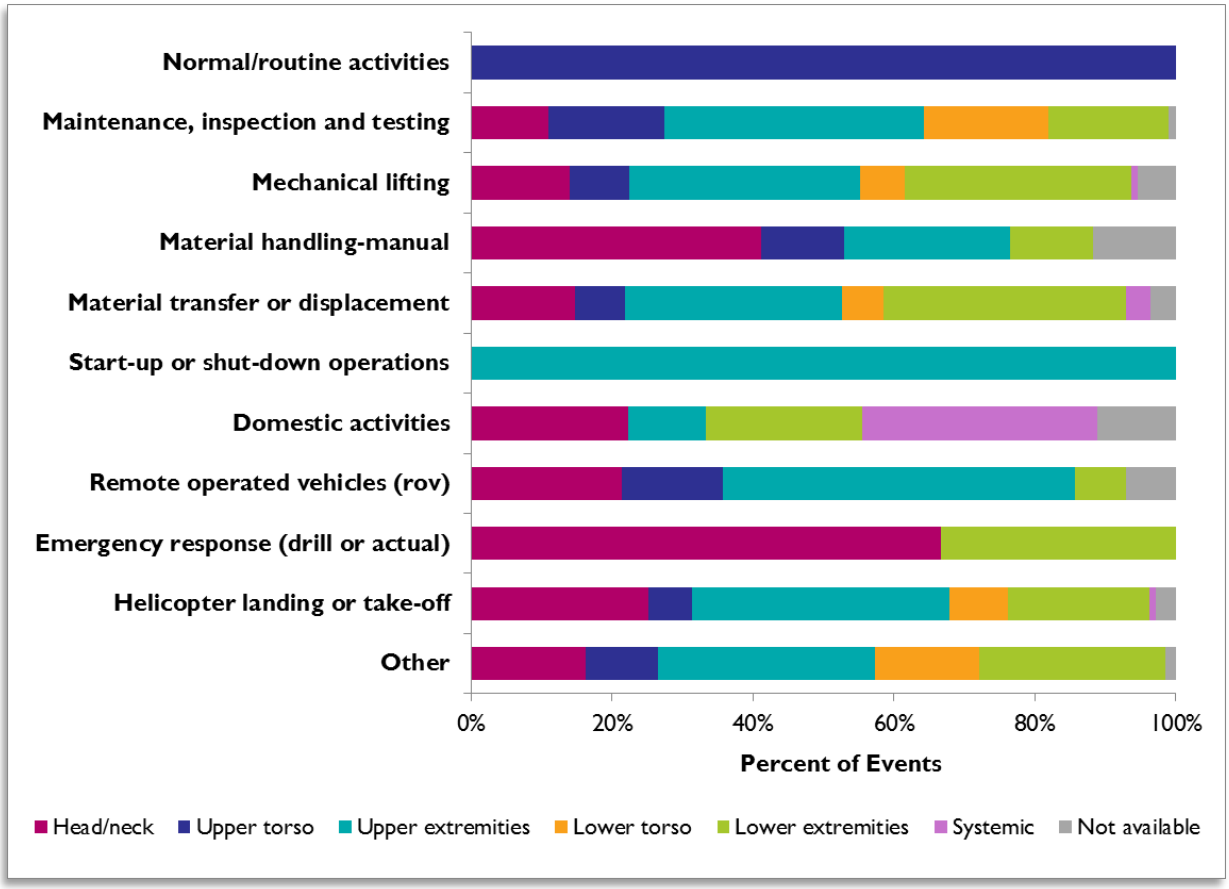


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

For emergency response (drill or actual), many events had unknown body part information, mainly due to forms not being filled out as thoroughly when an event occurred during a drill.

As shown in figure 34, for *well work* activities, during *emergency response*, *head/neck* injuries made up the largest portion. During *start-up or shut-down* operations only *upper extremity injuries* were reported. Unlike injury events associated with *normal/routine* activities during *production (figure 33)*, injuries related to *normal/routine* activities during *well work* involved exclusively the *upper torso*.

Figure 34: Details on Injuries during Well Work by Primary Activity

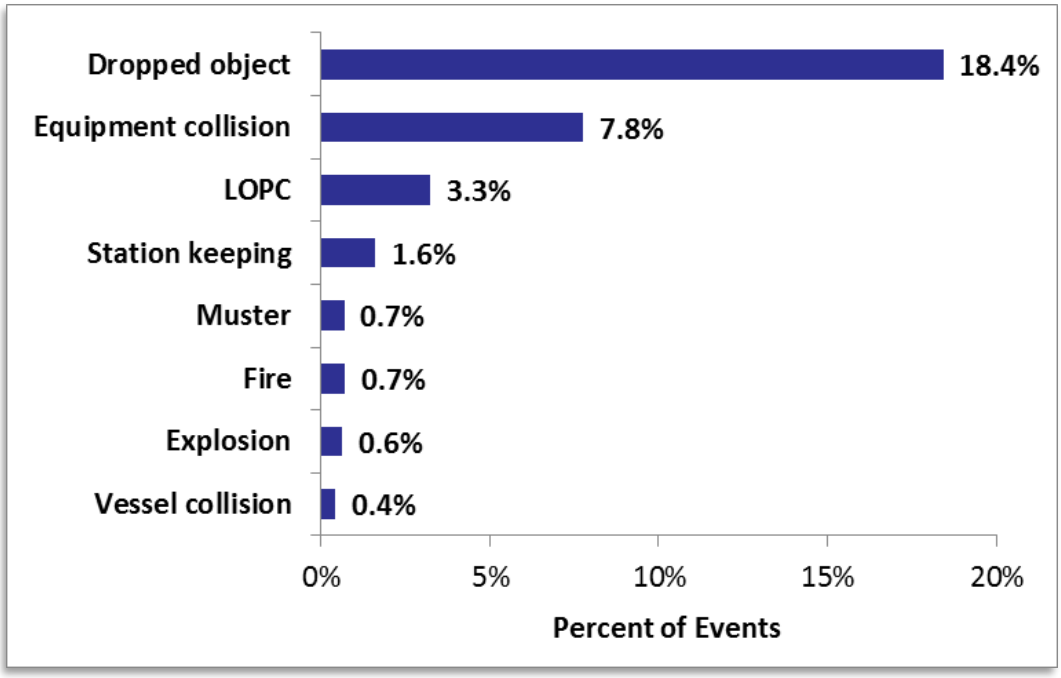


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Attributes of Events Involving Personal Safety

Over 70 percent of *personal safety* events were not associated with any attribute other than personal safety. The remaining personal safety events were associated with at least one or more additional factors, as shown in figure 35. Approximately 18 percent of personal safety cases also involved a *dropped object*. Similarly, approximately 8 percent of personal safety cases also involved *Equipment Collision*.

Figure 35: Additional Event Attributes Associated with Personal Safety Events

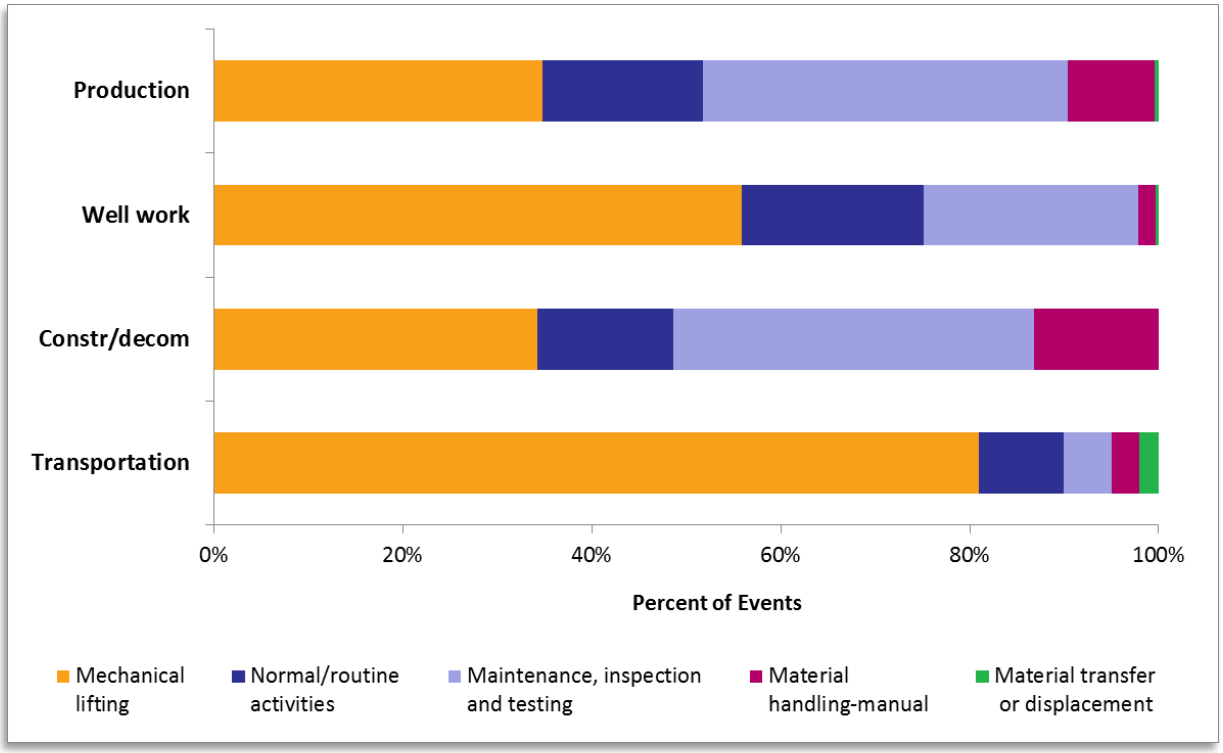


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Personal Safety Events Involving Dropped Objects

Figure 36 compares the *primary activity* being conducted when *dropped object* events occurred within each *operation group*. *Mechanical lifting* was the leading type of primary activity during dropped object events, which appears to support an anticipated correlation. Although formally classified *as mechanical lifting*, *tubular handling* (drill pipe and casing) is considered *a normal/routine activity* during *well work* by some participating companies. As a result, *normal/routine activities* have a higher percentage of the *dropped object* events in the *well work* category, as compared to the other three operation groups. The large amount of equipment present on derricks during lifting may also be a contributing factor to the large number of dropped objects.

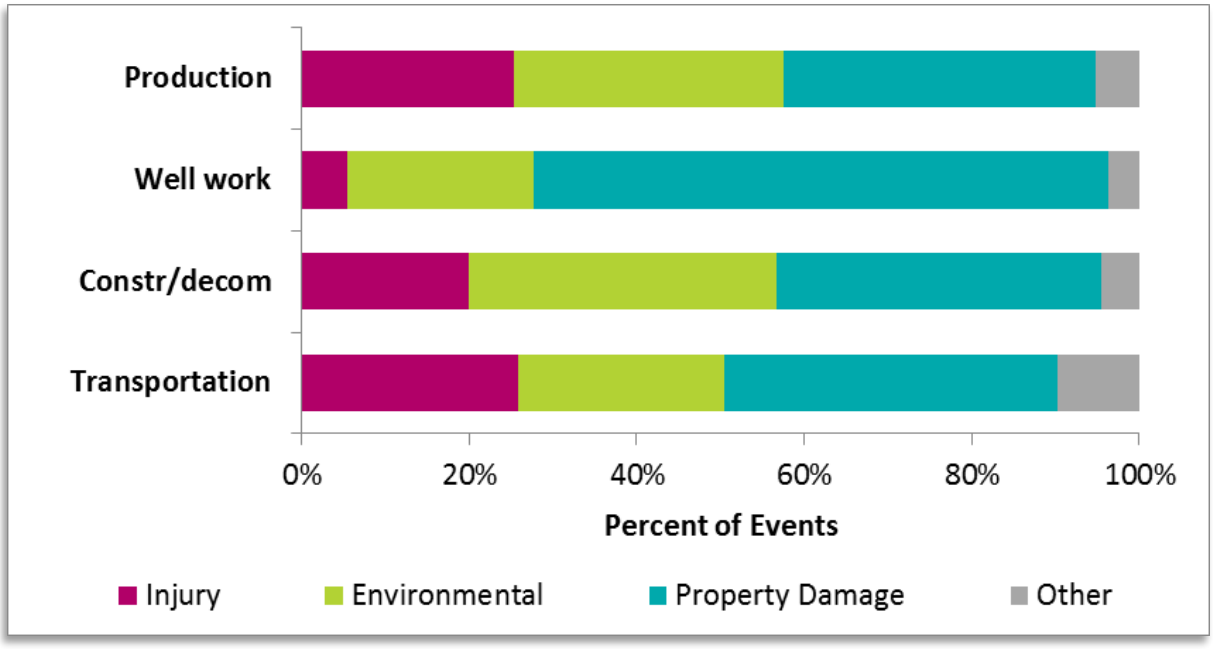
Figure 36: Primary Activity Type for Dropped Objects by Operation Group



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

As shown in figure 37, *property damage* was the leading *consequence* of *dropped objects* during *well work*. This was primarily due to new rig start-ups and dropped objects from derricks on established drilling rigs. The implementation of the *red zone*[14] in drilling operations may be a contributing factor to the relatively low number of dropped object events with actual consequences and a high percentage of dropped object events with only potential consequences in *well work* activities. The relatively high number of dropped object events with *property damage* in *well work* appears to be due, in part, to the high frequency of lifting operations in that environment. Many of the *dropped object* events with *environmental* consequences involved objects dropped to sea, and the object may or may not have been recovered.

Figure 37: Consequences of Dropped Objects by Operation Group



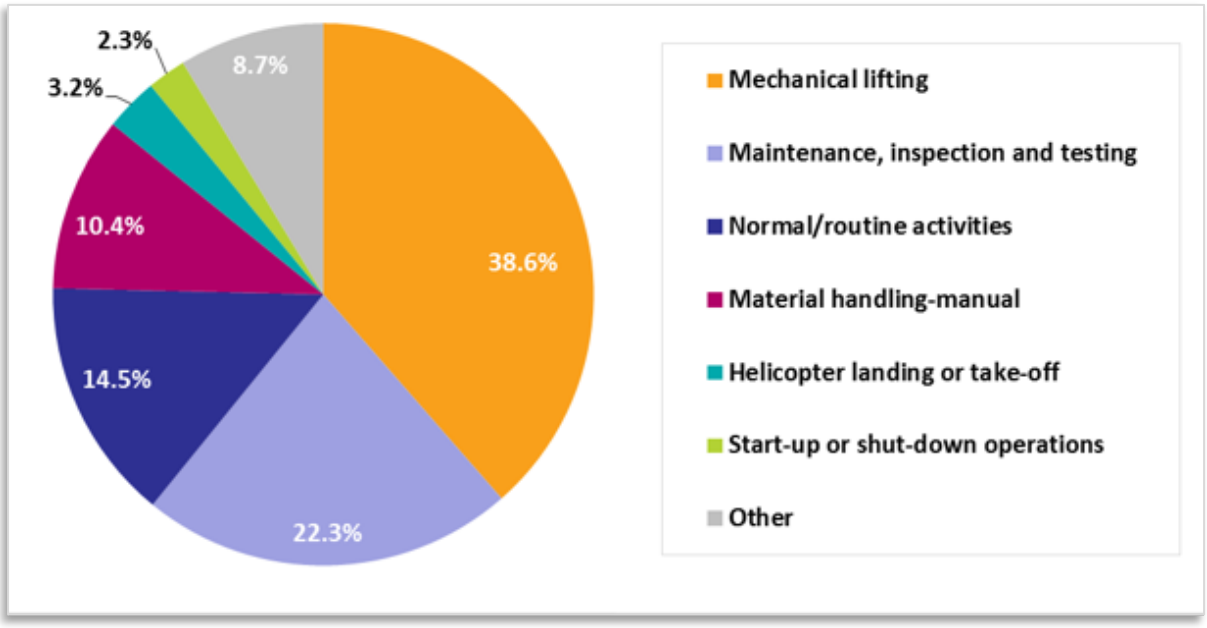
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

[14] A *red zone* is a temporary workspace established on a vessel/facility in high-risk areas during lifting and other operations. The workspace is demarked with visual cues such as red tape, red light signals, and the like. It alerts workers to the increased likelihood of injury from the movement of large/heavy equipment.

Personal Safety Events Involving Equipment Collision

Mechanical lifting operations resulted in 38.6 percent of *equipment collision* events which are broken down by *primary activity* in figure 38. *Contributing factors* for this were sea states (sea conditions) that created additional hazards to unloading and back loading equipment on supply vessels. Other factors included trying to maneuver cargo in tight deck spaces and cargo breaking loose from its bindings and moving on the vessel's deck while in transit.

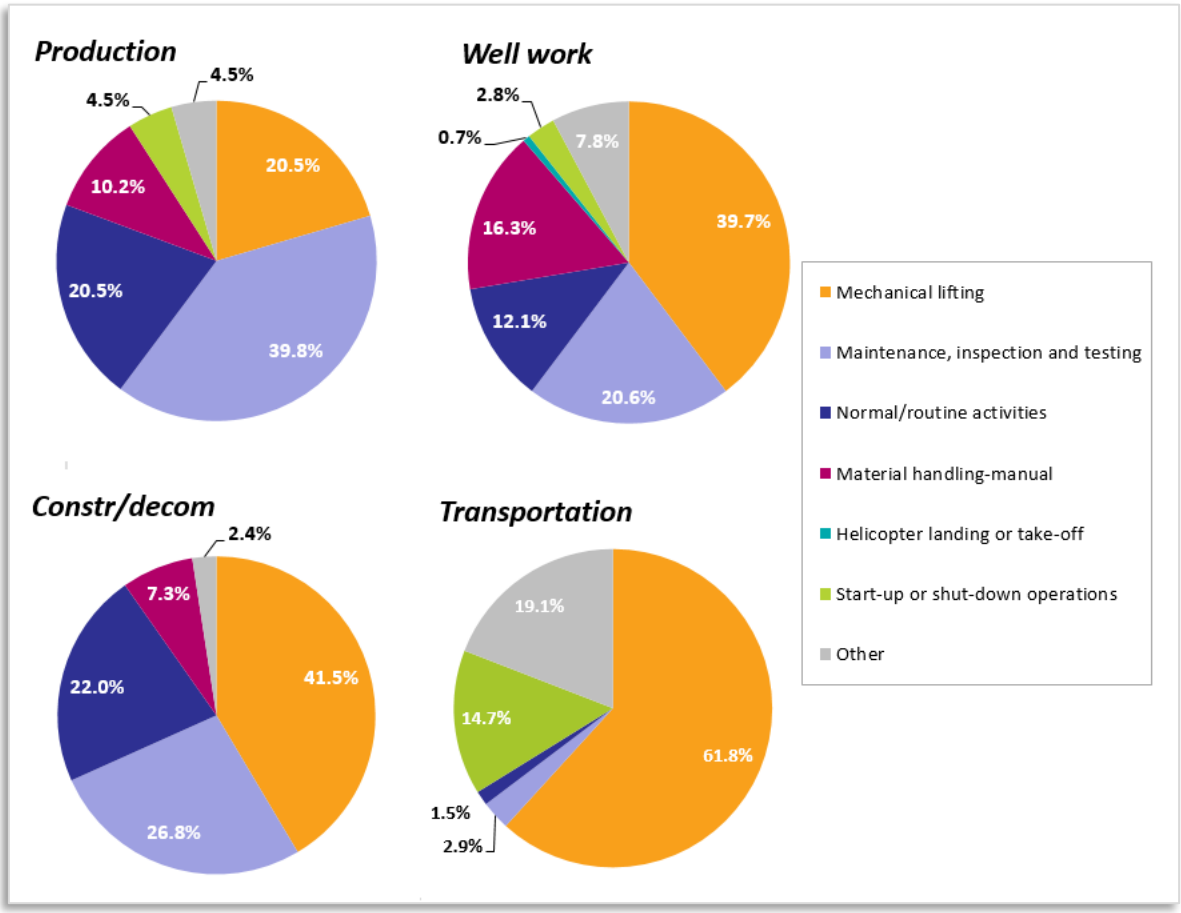
Figure 38: Equipment Collision Events by Primary Activity



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

The frequency of *mechanical lifting* events in *well work* appears to be a contributing factor to the high percentage of collisions involving mechanical lifting during well work operations. That said, it is also important to recognize the variation in how companies categorize these events. Transportation involves more *mechanical lifting* than other operation groups since supplies are transferred between marine vessels and production platforms or drilling rigs. Activities represented by the *other* slice are those that made up less than one percent of personal safety events involving equipment collision (figure 39).

Figure 39: Equipment Collision Events by Operation Group



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Personal Safety Events Involving LOPCs

Although *LOPCs* are more commonly associated with *process safety* and/or *environmental* risks, they can also result in *injuries* or *illnesses* when leaked fluids come in contact with personnel. Just over half of the events involving personal safety and LOPC resulted in injury. Chemical burns and foreign objects or debris in the eyes were the two most common injuries in these events. LOPCs are discussed further in both the *process safety* and *environmental stewardship* sections.

Personal Safety Events Involving Station Keeping

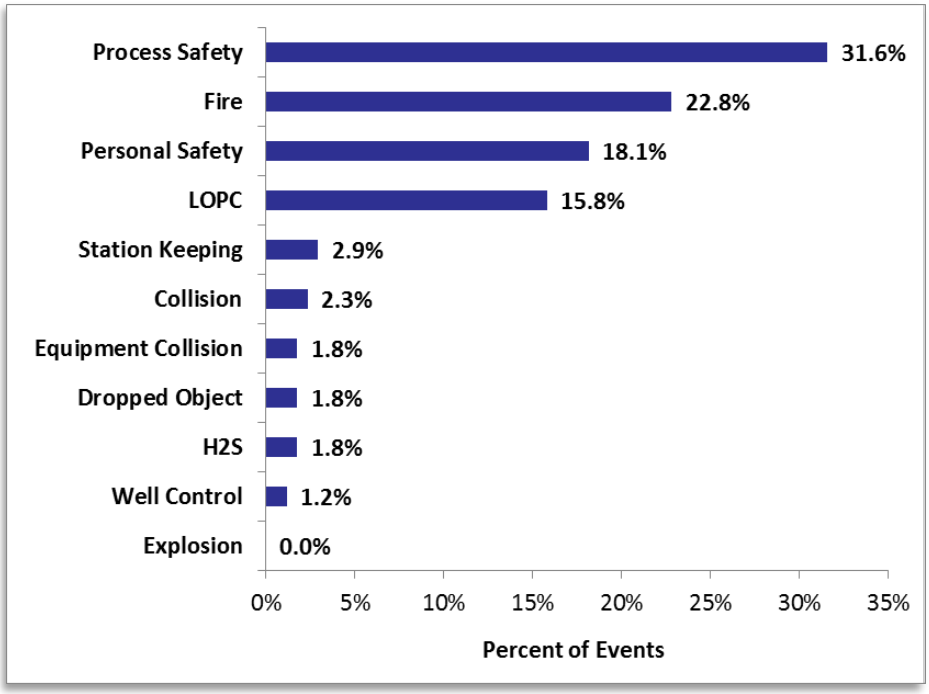
Station keeping involves maintaining a vessel or floating structure at a constant position relative to other structures or vessels or a fixed point. Whenever station keeping is not maintained, the vessel or structure can drift from its desired position due to the current and/or the wind. *Vessel collision* can occur as a consequence, and those events are covered in the next section.

Station keeping events also include cases where high seas cause a sudden shift in the vessel or its cargo and lead to injuries or property damage. This was the case in about two-thirds of the station keeping events where there was no collision. Many of these events occurred during mechanical lifting of cargo or lifting of the personnel transfer basket that is used to transport people between the vessel and a structure.

Personal Safety Events Involving Muster

On an offshore facility, personnel are called to *muster* (gather) in the event of a fire alarm or other emergency. Approximately one percent of the reported events indicated that a full muster was conducted.

Figure 40: Event Attributes Associated with Muster Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD

Figure 40 shows the reasons associated with these musters. In many of these events, an actual muster was deemed unnecessary after the incident was investigated. On several occasions when it was determined early that a muster was not required, the facility continued with it as a training event.

Personal Safety Events Involving Fire

Of 117 reported *fires*, four resulted in *personal injury*. In two cases, employees were burned; one resulted in a *first aid* injury, and the other was a *lost time* injury. In another case, an employee trying to escape a fire suffered a *lost time* injury due to a fall to the water. The fourth fire event resulted in a *first aid* injury to the firefighter. A high number of *accommodation fires* in both *well*

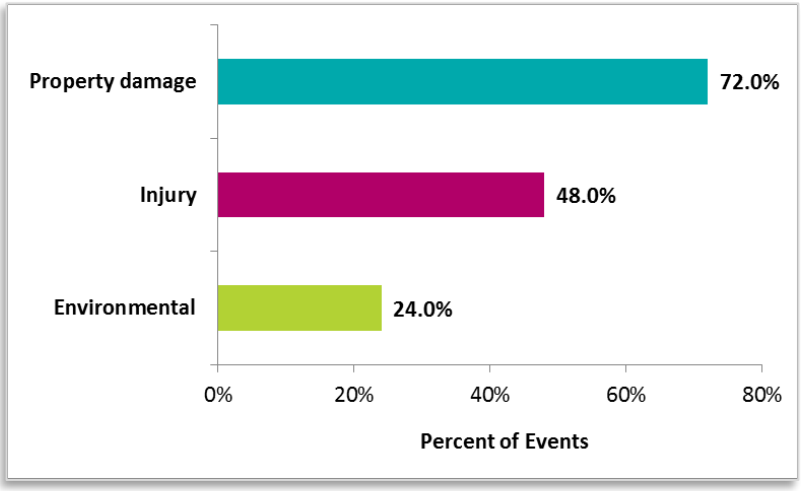
work and *production* facilities were related to clothes dryers – either equipment malfunctioned, smoldering towels removed from the dryers, and/or contraband cigarette lighters laundered with personal clothes.

Based on the reported data, all fires identified were quickly and effectively extinguished. In most cases, fire extinguishers were located extremely close to the fire, which reduced the response time to the incident. Fires in offshore supply vessel engine rooms were also handled in a similar fashion to those on production/well work facilities. The main causes were ignition of insulation from engine exhaust manifolds.

Personal Safety Events Involving Explosions Not Accompanied by Fire

Any sudden or unexpected release of energy is potentially dangerous to personnel, the environment, or the equipment. As discussed previously, most of the reported events involving *explosions* were not accompanied by fire (approximately 90 percent), and many did not involve hydrocarbons. Most were events that resulted in some degree of *property damage* (along with other consequences), as shown in figure 41.

Figure 41: Consequences of Events Involving Explosions



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Damaged equipment included batteries, hose ruptures, pressure relief valves and explosion proof lights. Twelve of the events involving *explosions* included *injuries*, with one *fatality* during a tank cleaning operation in a confined space. All of the *injuries* occurred when an explosion caused either a part of the equipment, or the fluids or solids contained within the equipment, to strike the worker. There were no fires before, during, or after these events involving injuries. *Injuries* also included one medical treatment case and one restricted work case. The remainder were first aid or non-treatment cases. Over 50 percent of the explosions that

took place during *production* operations occurred in the *process* or *well bay* areas. Two of the explosion related events involved *well work*.

Personal Safety Events Involving Vessel Collision

Of the 17 *personal safety events* involving *vessel collision*, 8 were helicopters in flight that experienced near-misses with wildlife (seagulls), other aircraft, a platform crane, or mechanical issues. All of the helicopters were safely landed without personnel injuries.

The remaining vessel collision events involved marine vessels striking another vessel or a fixed structure, causing *property damage* and personnel *injuries*. A few vessel collisions resulted in *property damage* but no injuries.

Special Topic: Personal Safety Events Involving Falls

The following high-level analysis of *falls* is included within this Phase I report, as an example of the type of analysis that could be done in the future. *Falling* in this analysis means that an individual lost balance and suddenly descended enough to cause part of the body besides the feet to contact the *floor* or *another surface*.

BTS selected the following *groupings of falls* to study in more detail. Two of the types of falls were sub-divided into a second level:

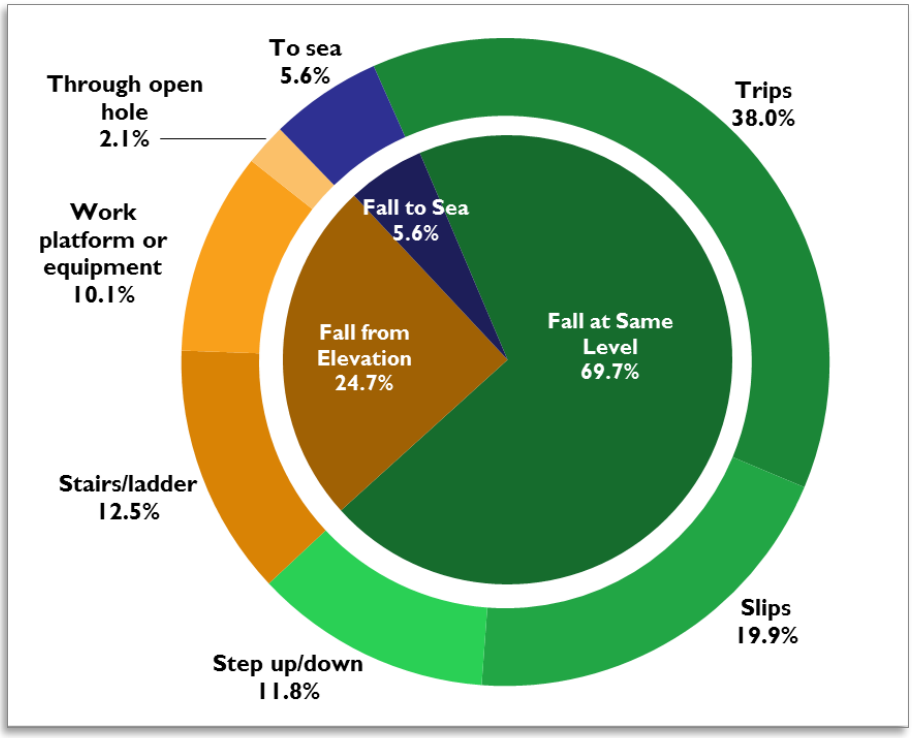
1. *Fall to sea* – a person falls from any height from any structure to the sea.
2. *Fall from elevation* – a person falls from some elevation greater that one step up or down. If the fall from elevation is also a fall to the sea, it is considered a fall to sea. Subcategories include:

    - Stairs/ladder - falls while ascending or descending on stairs or a ladder;
    - Work platform or equipment - falls from a temporary or permanent work platform or elevated equipment (access) platform or pedestal; and
    - Through open hole - falls from elevation from one deck or level to another, often through an open hole in a deck (excluding falls to sea).

3. *Fall at same level* – a person falls while on the same level/surface or while taking one step up or down. If the fall is at the beginning or end of a set of stairs or steps, it is considered a fall from elevation. Subcategories include:

- Trips – falls caused by tripping or stumbling on raised or uneven surfaces or obstructions in the pathway or tripping by catching one foot/leg on the other;
- Slips – falls caused by loss of traction between the shoes and the floor or walking surface; and
- Step up/down – falls while taking a step up or down from one level to another when there is only one step between the levels, such as a raised section of decking.

Figure 42 shows the frequency of the types of falling events reported. *Slips* and *trips* were the main cause, accounting for 57.9 percent of falls. *Falls from elevation* accounted for 24.7 percent of the total falls; however, falls from elevation resulted in more serious injuries. A closer review of the 2014 – 2017 data revealed many falls resulting from deficiencies in platform grating. Having access to more detailed information for this type of events may present an opportunity for improvement in future data collections and analysis.

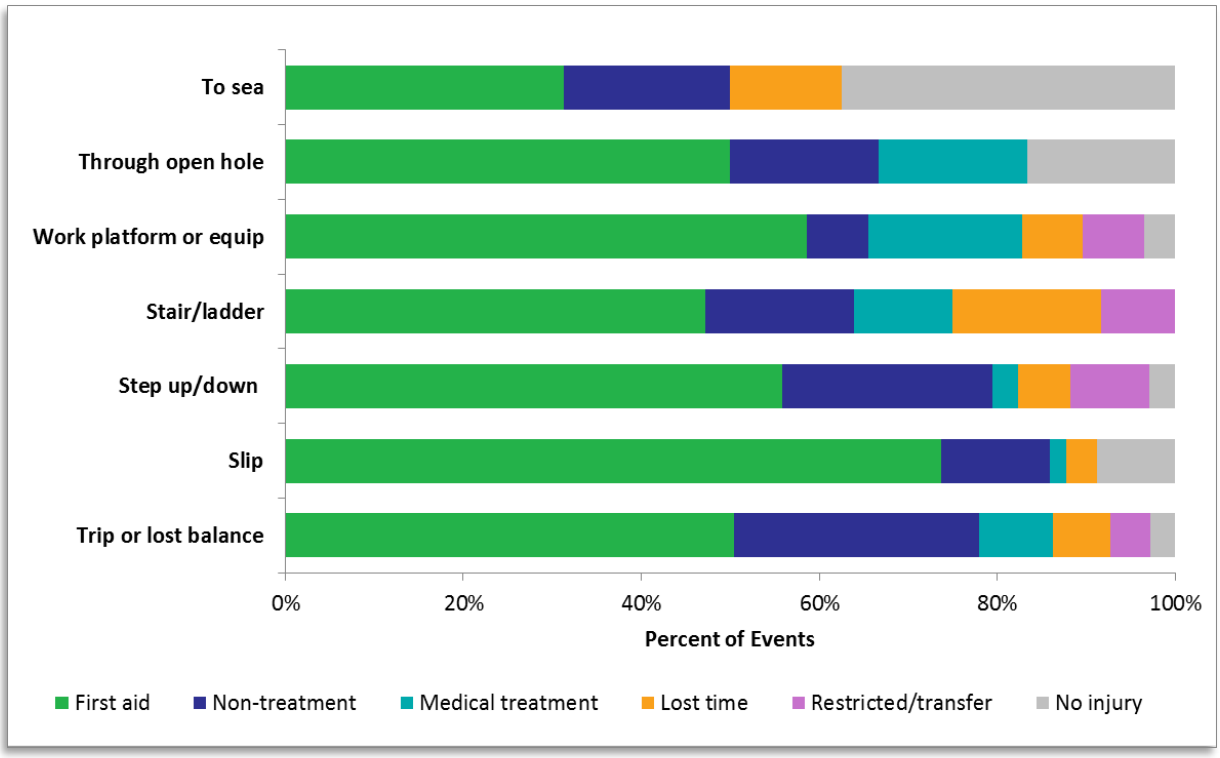


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Of falling events that were a *fall at the same level* or a *fall from elevation* on the facility, about 75 percent resulted in a first aid or more serious injury. Figure 43 shows the severity of those injuries from *most* to *least* severe.

Analysis of reported events showed several significant falls resulting in *injuries* and *lost work* time. Approximately 36 percent of falls from *stairs/ladders* resulted in recordable injuries (medical treatment or more serious), followed closely by 31 percent of falls from *work platforms or equipment*.

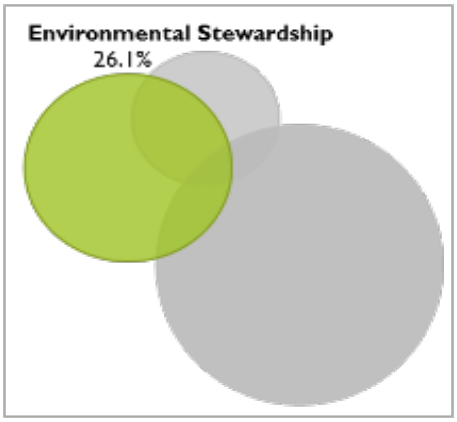
Figure 43: Injury Classification Associated with Falling Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Falls to sea resulted in the highest percentage of *recordable* events. *Falls through an open hole* did not result in any lost time injuries primarily because the employees caught themselves before falling entirely through the opening. *Falls to the sea* had the highest percentage of no injuries because most of the reported cases involved falling from relatively low heights such as falling overboard from the crew vessel.

ENVIRONMENTAL STEWARDSHIP

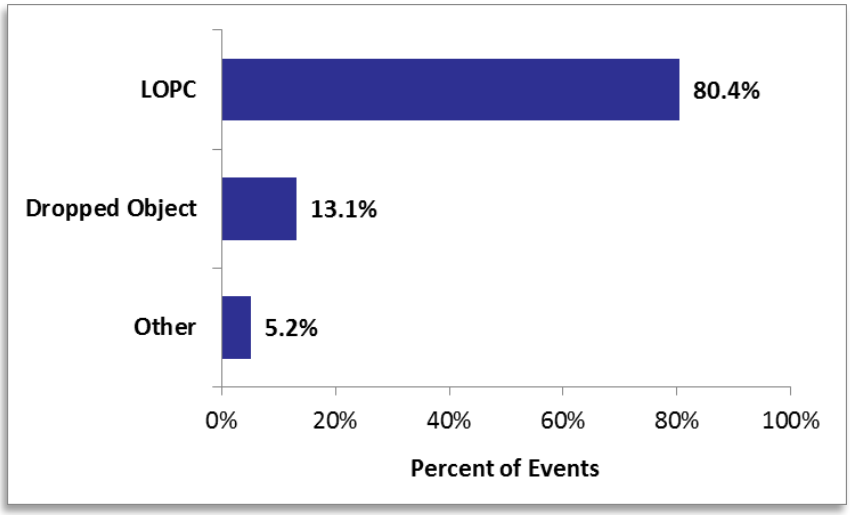


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Over one quarter (26.1 percent) of all events involved *environmental* consequences. Although there is a significant overlap between *environmental stewardship* and *process safety* events, only events with actual environmental consequences are included in the following analysis. Events with potential environmental consequences were excluded in order to focus on events with actual consequences. Figure 44 shows the percentage of environmental consequences associated with other categories.

Key among events involving environmental hazards are events related to the *loss of primary containment* (LOPC), as these events may involve the release of oil or other contaminants to the water. *Dropped objects* represent another important issue involving environmental hazards and are highlighted in the data. Although dropped objects that are contained on the offshore facility are important from a personal safety perspective, dropped objects that are lost to the sea and not recovered can present their own concerns depending on what is actually lost. This section discusses additional analysis of events involving *LOPC* and *dropped objects* to sea. Events labeled *other* in figure 44 were reports of temporary sheens or gas bubbles that were observed near a facility but confirmed not to have been caused by the facility. These events are referred to as *mystery sheens* because their source is

Figure 44: Events Primarily Associated with Environmental Consequences



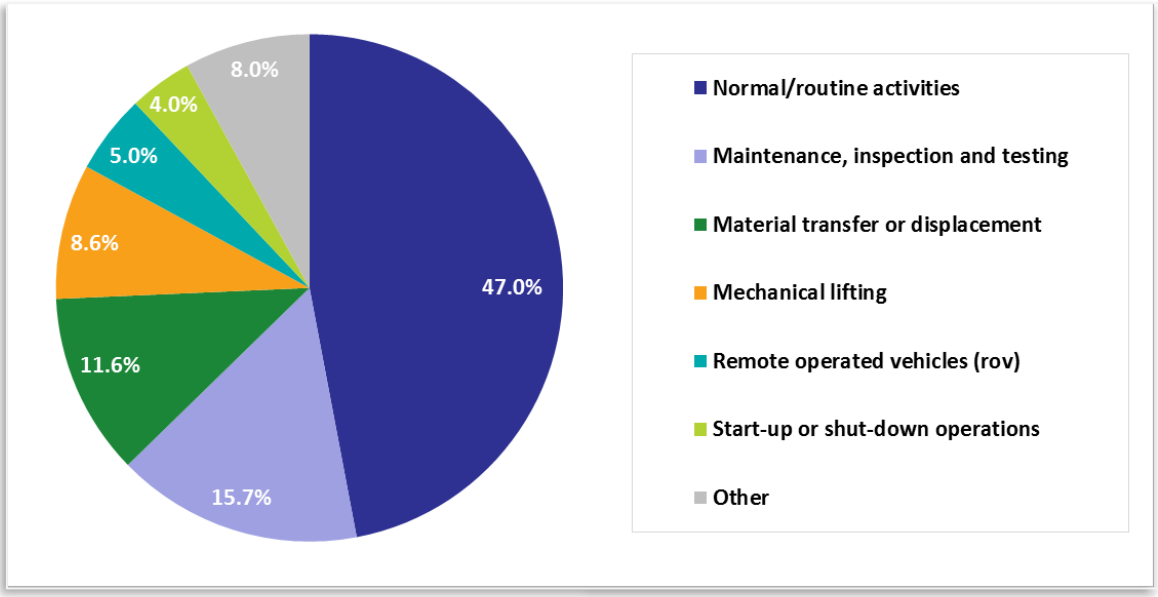
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

often not found or there is no equipment in the direction of the suspected source. Sometimes these mystery sheens and/or bubbles are caused by naturally occurring seepage on the sea floor. Others may be caused by a marine vessel a significant distance away from the facility where it was reported.

LOPC

Most LOPC events occurred during normal/routine activities in *production* and *well work* operations. Figure 45 provides a breakdown of the *primary activity* being conducted at the time of the event.

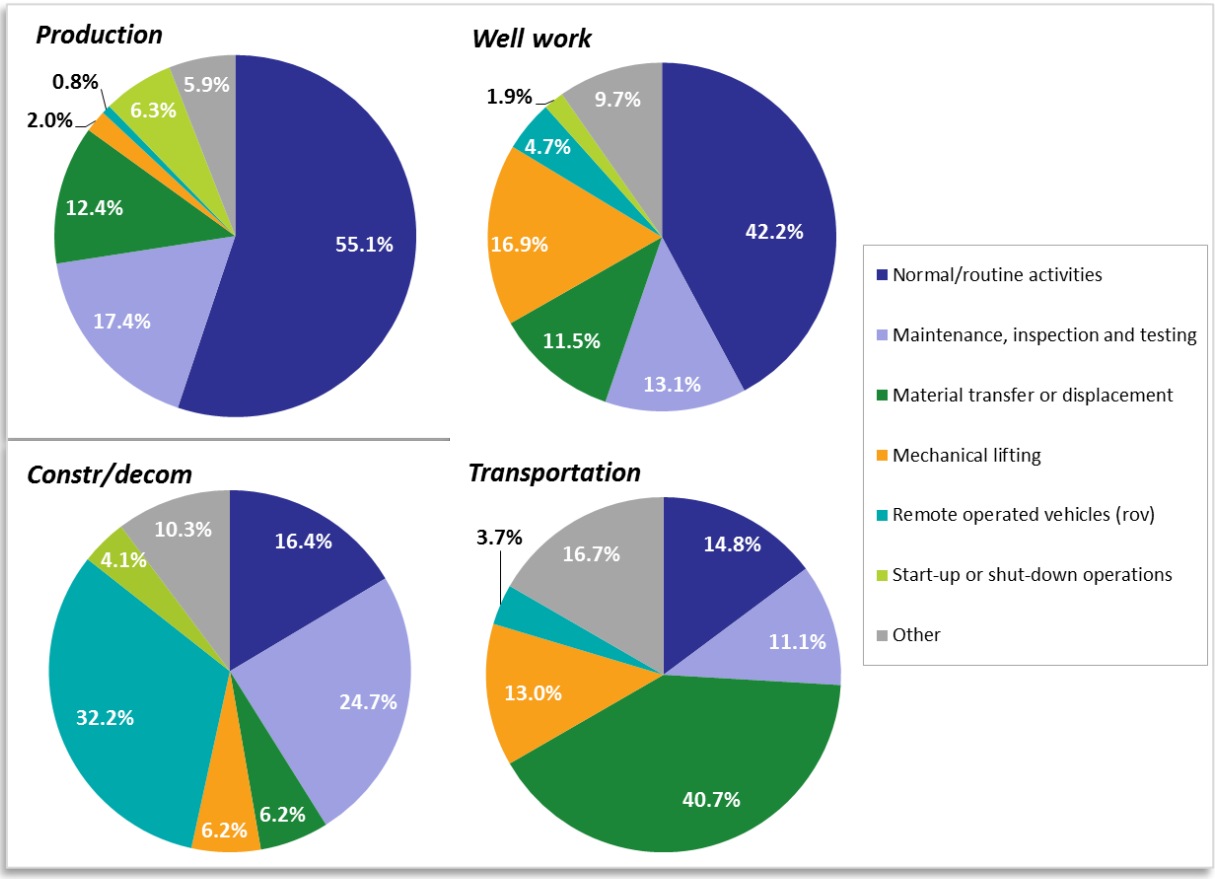
Figure 45: LOPC Events by Primary Activity



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Most LOPCs occurred during *normal/routine activities*; however, many also took place during *maintenance/inspection/testing*, and *material transfers or displacements* (figure 46). Many of the LOPCs in *well work* operations were a result of leaking/failed hydraulic control hoses.

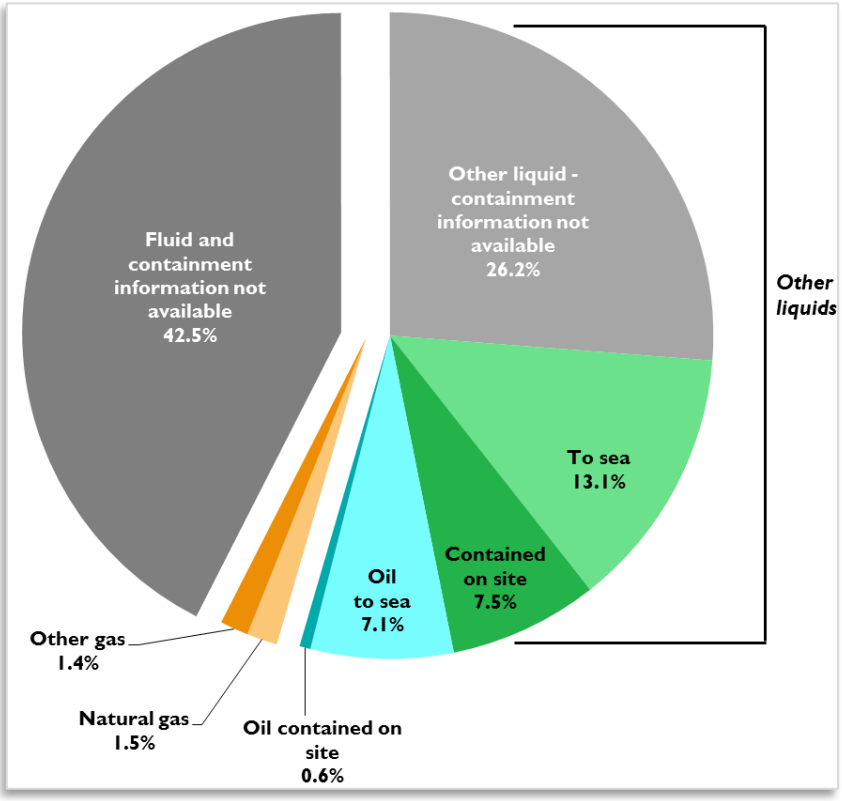
Figure 46: LOPC Events by Operation



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

The severity of environmental impact was previously described within the process safety tier levels, which relates to the volume released, as well as other consequences. Figure 47 provides information on whether the released fluid was contained. The dark gray segment represents events where neither the fluid nor the containment information is available (42.5 percent).

Figure 47: Containment of LOPC Fluids during Environmental Events



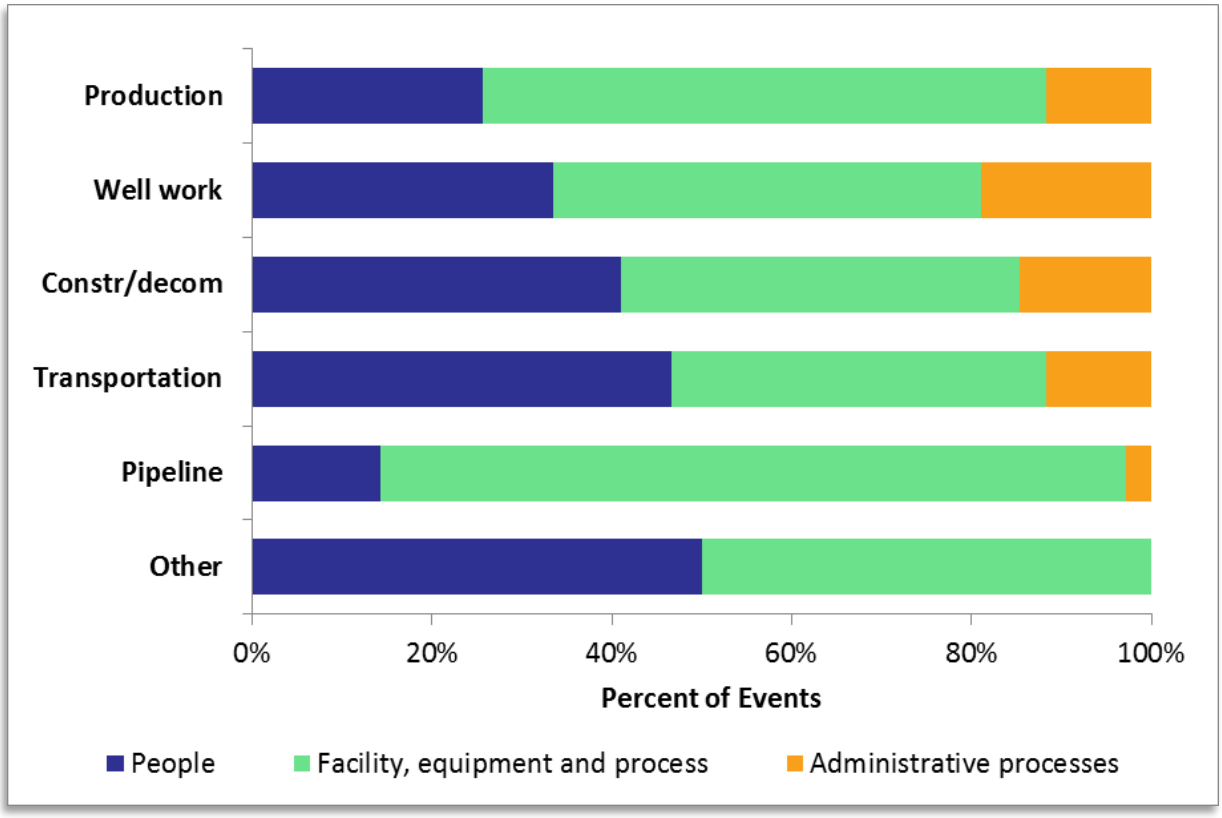
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Focusing on the environmental aspect of the events where the fluid information is available, the majority were liquids, which can often be contained. The light gray segment shows events where liquids were released but the containment information is not available (26.2 percent). Liquids are further separated into those which were contained on site versus those that reached the sea.

Leaks of natural gas or other gases, which cannot be contained, represent approximately 3 percent of the events where fluid information is available. The analysis shown in figure 47 could provide meaningful insights with a more representative and complete dataset.

The *causal factor* breakdown for *LOPC* events in each *operation group* is shown in figure 48. *Facility, equipment, and process* reliability is the most frequent causal factor, far exceeding any other category. This pattern is evident in both the *production* and *pipeline* operation groups.

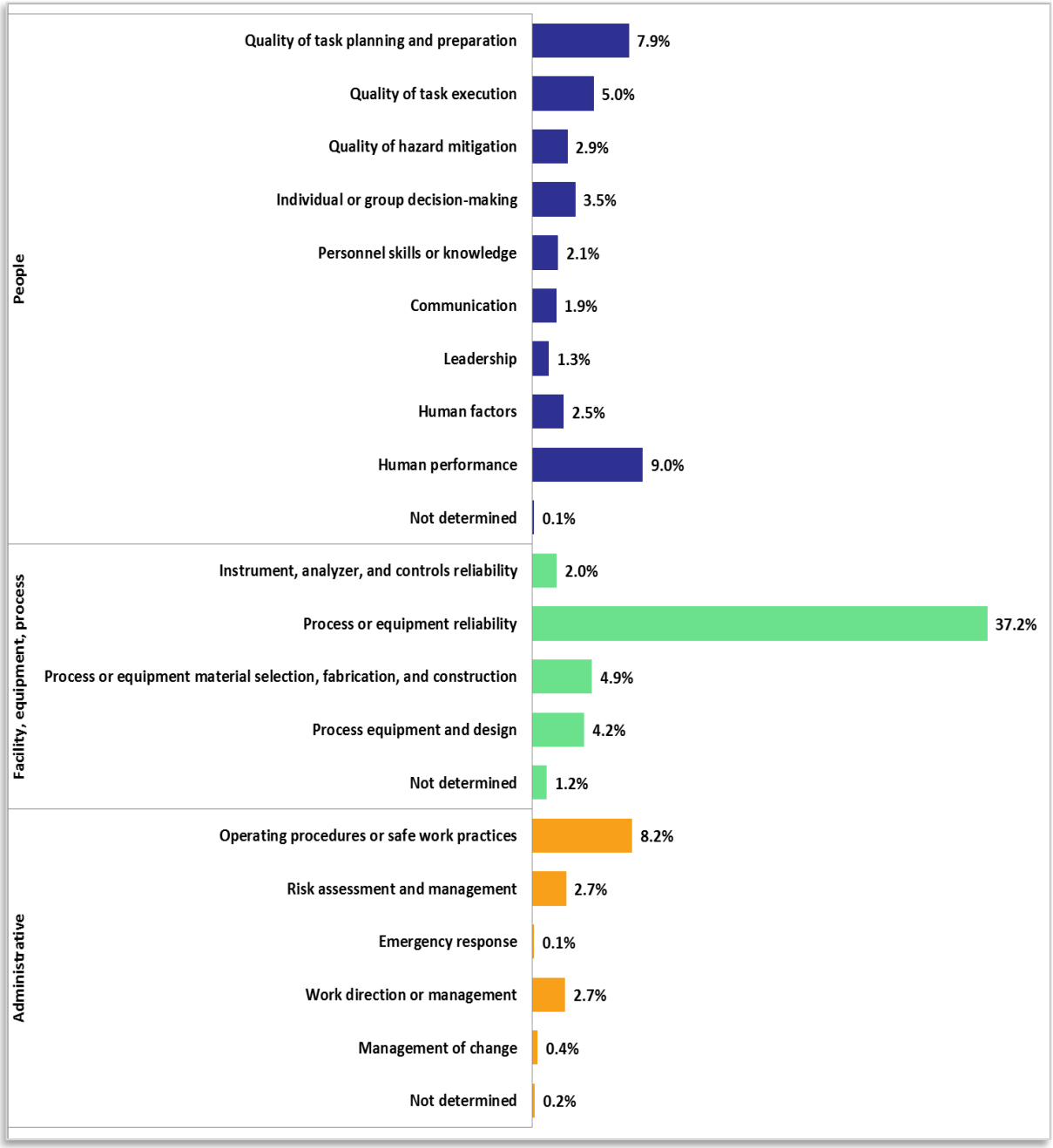
Figure 48: Causal Factors of LOPC Environmental Events



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Shown in figure 49 are the *causal factor* details for LOPC *environmental* events. *Process or equipment reliability* were the prominent cause of events when related to the *facility, equipment, or process*. When the cause is *people* related, *human performance* and *quality of task planning and preparation* are key. When the cause is *administrative*, *operating procedures and safe work practices* are a key causal factor.

Figure 49: LOPC Environmental Event Causal Factor Details

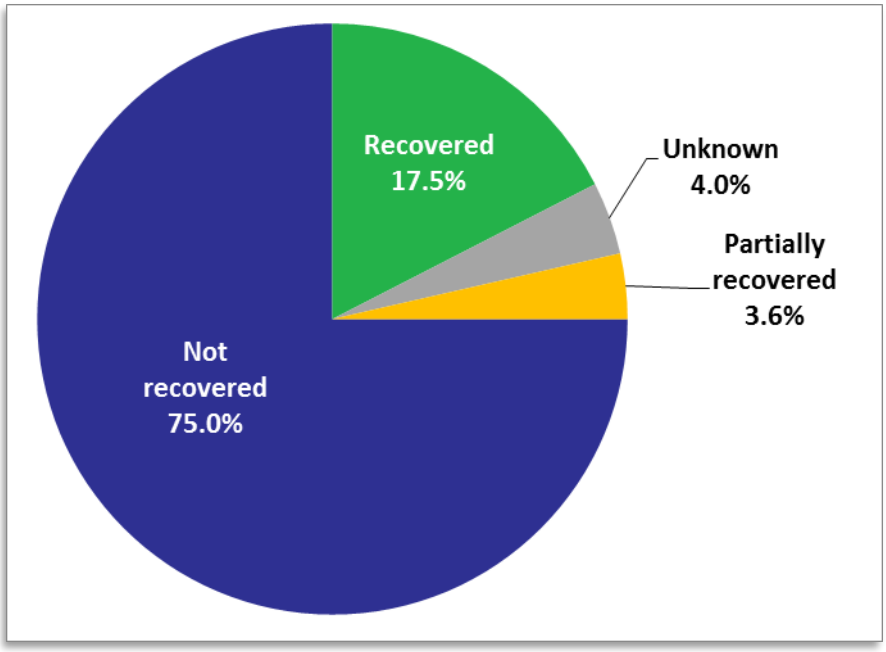


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

Objects Dropped to Sea

Out of the 1,479 *dropped object* events, 17.0 percent involved objects *dropped to sea.* Figure 50 shows that most objects that were dropped to sea were not recovered (75.0 percent). Frequently recovery of small items dropped to see in deep water or during high winds, often accompanied by high seas is extremely difficult, if not impossible.

Figure 50: Recovery Status of Objects Dropped to Sea



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, ISD Program, August 2019.

6 Learnings and Recommendations from Phase I

6.1 KEY LEARNINGS

BTS and representatives from the nine participating companies evaluated the results of Phase I and determined that the ISD Program is feasible. Furthermore, Phase I results proved that companies can submit data to BTS in different formats and BTS can map the data to a common SafeOCS ISD structure to allow for effective and meaningful data aggregation, review, and analysis. The key learnings from Phase I are summarized below:

- ISD Phase I participating companies agreed on the value of sharing data for both consequential and lesser events which had the potential to lead to a major event.
- Legal and confidentiality concerns expressed by participating companies were satisfied with the protections afforded under the Confidential Information Protection and Statistical Efficiency Act (CIPSEA) and with the signing of a Memorandum of Agreement (MOA) between BTS and individual participating companies.
- A process was developed to map disparate data from individual companies to a single database thereby addressing the technical challenge associated with collecting, mapping, and aggregating data from different company-specific databases.
- The nine companies participating in Phase I successfully identified core data fields to be used as the foundation for the ISD Program in order to generate meaningful learning opportunities for the industry.

The pilot was restricted to data input from nine companies operating in the GOM and was an attempt to demonstrate the feasibility and potential benefits of an offshore industry-wide safety data repository. Although the results described in this report represent only the Phase I participants and thus should not be interpreted as being representative of the entire offshore industry sector, they illustrate the data analysis process that could be implemented for ISD Program moving forward.

6.2 RECOMMENDATIONS FOR FACILITATING DATA COMPATIBILITY

A key aspect of the SafeOCS ISD Phase 1 Program is that BTS accepted data in disparate formats to ease reporting burden of participating companies. A procedure was developed to *map* the company-specific data to the ISD database. As the ISD Program progresses, it will be important to consider the following enhancements to both the program itself and the company-specific data submissions, to facilitate data mapping and improve data analysis:

- Participants are encouraged to provide data for all the identified core data fields:
    - When companies do not share all available data for safety events, it limits the ability of BTS to effectively aggregate the information and identify meaningful data trends.
    - The strength and value of SafeOCS ISD can be increased when industry supports and promotes the collection and reporting of near-miss and precursor safety events. This entails providing event data (i.e., events at the bottom portion of the safety triangle) that is often not-reportable to BSEE and is only captured as part of internal company-specific systems.
    - To enhance the depth of analysis, companies are encouraged to submit additional information about unsafe actions or conditions (e.g., safety observations) because a subset of them under certain conditions can potentially become precursors to safety events.
- Companies are encouraged to consider how they may improve integration or harmonization of their company's data systems. Some companies face a challenge when submitting core ISD data to SafeOCS because data reside in separate and very different data systems within a company. This can make data submission of the requested core data fields more cumbersome.
- BTS plans to expand the use of drop-down menus instead of text fields to harmonize data entries and address challenges encountered regarding data field inconsistencies and misspellings such as:
    - Inconsistencies and misspellings on terminology used for facility/asset types, operation types, and activity types present a challenge for effectively mapping and aggregating the information.
    - Company-specific terminology for similar facilities varies, therefore drop-down menus would serve to standardize the available choices.

    - For assets labeled as mobile offshore drilling units (MODUs) in Phase I, the asset categories of *drill ship*, *jack-up*, and *semi-submersible* were merged to allow data comparison and analysis of aggregated data; however, participants are encouraged to make this distinction on future submissions.
    - Identify variances in terminology used to describe practices, processes or facilities and begin to harmonize across the industry to improve opportunities for analysis. For example, consider splitting up *drilling/workover* and *completions*, as well as list *Well Bay/Moon Pool* as two separate categories.
    - Given the typical additional preparation, hazard identification, and risk mitigation associated with *special permitted activities* (e.g., energy isolation, hot work, etc.), consider the benefits of capturing these data as a separate data field.
- Given that a key premise of the ISD Program is to capture more than what is currently required, all participants are encouraged to provided data related to safety events that may occur while off-shift. An off-shift event can include an illness or injury that occurred off property but continued or worsened while offshore. They can also include other significant events that occur during off-hours in the accommodations section of an offshore facility. Although these events may not be subject to regulatory reporting requirements (i.e., considered non-work-related), voluntarily sharing of this expanded set of safety events may yield valuable learnings for the industry.
- All companies are encouraged to consider quantifying the seriousness (i.e., potential injury consequences) of dropped objects using an industry recognized dropped objects calculator.
- To further assist with identifying and merging multiple records submitted for the same event either by the same company or their contractors, it would be helpful if company-specific data files highlighted which operator the work was being performed for, or which contractor was conducting the work.
- Participants should consider the following recommendations regarding causal factors, which are important in identifying potential safety trends in the types of events that may be of concern on an industry-wide basis and warrant further analysis. Causal factor information provided by participants was inconsistent, due to either the scope of event information provided or variations in the causal factor methodologies employed.
    - Participants are encouraged to provide either more categorical information about causal factors and/or more detailed text descriptions of the event.

- To the extent practicable, companies submitting data should strive to provide additional event details (such as incident investigation reports, photos, etc.) to support more meaningful analyses and avoid complicated data structures. Examples include:
    - Avoiding redacting information that could otherwise prove beneficial during the data mapping and aggregation processes (e.g., event record key),
    - Avoiding merged or hidden cells,
    - Providing detailed documentation on how to manage records attributed to *third parties*.

- For ISD Phase I, companies generally transferred data to BTS as a single block or several blocks; this frequency of transfer was appropriate for the initial ISD effort. Moving forward, it is recommended that the voluntary submission of company data be done, at a minimum, on a quarterly basis to allow timely analysis and review of key trends, instead of annual submission. It will also assist BTS in balancing the data processing workload throughout the year.

7 Next steps

Based on input from the nine participating companies, BTS is developing a plan to address the following areas: a) promoting wider industry participation in SafeOCS; b) facilitating industry use of learnings from the ISD report; and c) enhancing the capabilities of the SafeOCS ISD Program.

7.1 Improve Industry Participation

As the number of SafeOCS participating companies grows, more data can be captured, analyzed for trends, and actioned with the goal of preventing more serious events. BSEE and BTS will continue outreach efforts to inform additional companies about the ISD Program and encourage participation. SafeOCS ISD information sessions were previously held in July and December 2018 which resulted in doubling the number of companies participating in the program. Future outreach efforts can leverage the Phase I results detailed in this report.

As SafeOCS ISD progresses beyond Phase I with an increased number of participants, BTS will plan to host orientation sessions that will address the following:

- Minimum data submission expectations, including supporting event narratives
- Specific BTS activities involved with data processing
- BTS secure data room setups
- Timing for data submissions

7.2 Encourage Learnings From ISD Results

The ISD Program offers several opportunities for learnings to improve safety on the OCS. Examples include:

- Industry and government agencies may consider using the knowledge gained through this program to develop new or modified risk controls and support systems, such as training or awareness programs and host workshops and other similar events to discuss causal factors and develop actions to prevent reoccurrence;
- Participating companies, trade organizations/associations [e.g., IADC, API, IOGP, COS, OOC, Ocean Energy Safety Institute (OESI] and other stakeholders, including BSEE, may use any publicly-released information to enhance their ability to continually improve safety performance, including disseminating important safety information to oil and gas industry employees as well as creating or updating existing recommended practices;

- BSEE and BTS will work with industry to plan workshops or other sharing/lessons learned sessions to review aggregated results, network, and discuss potential actions to improve safety by preventing recurrence of adverse events.

7.3 ENHANCE ISD PROGRAM PERFORMANCE

BTS will engage in informed discussions with industry stakeholders, including oil and gas operators, drilling contractors, service companies, original equipment manufacturers (OEMs), and BSEE, to ensure the ISD Program provides value to stakeholders. Below are some enhancements being explored:

- Continue system upgrades and capabilities, including the development of a dashboard, to allow companies to view their own data online for purposes of comparing their performance against the aggregated results;
- Develop white papers on specific safety issues, such as transportation-related or other safety events;
- Cross-link the ISD database with other SafeOCS databases (i.e., Well Control Equipment (WCR) Failure Reporting Program, and the Safety and Pollution Prevention Equipment (SPPE) Failure Reporting Program), BSEE databases, and other data sources to provide more complete event details and evaluate potential data correlations;
- Develop analytical tools to identify low frequency events that could indicate the potential for a significant event (e.g., predictive modeling);
- Engage with BSEE to discuss trends seen in both ISD data as well as BSEE data.

Appendix A: ISD Phase I Codebook

#	Data Field Description	Acceptable Value	SAS Variable Name	Data Format	Comments
1	Event Description: Event Type: The type of an event is defined by whether an event has consequences or not.	1 = Event with consequences 2 = Event with no consequence (i.e., near-miss) 3 = Unsafe action or condition (i.e., safety observation)	Evt_Typ	Dropdown list	check one from the dropdown list
2	Event Category: General category of event that occurred	- Personal safety event - Dropped object/material overboard - Well control - Fire - Explosion - Process safety - LOPC (e.g., gas release/spill) - Collision - Equipment collision - Station keeping - Muster - H_2S - Non-work related - Other	Evt_Inv	Dropdown list	check all that apply from the dropdown list
3	Event Date: Date that the event occurred	MM/DD/YYYY	Evt_Dat	MM/DD/YYYY	MM/DD/YYYY format is recommended
4	Event Time: Time of day when the event occurred	HH:MM	Evt_Tim	HH:MM	Military time is recommended
5	Description of Event: Text descriptions of what occurred	Free text	Evt_Dsc	Free text	text description
6a	Actual Consequences: Descriptions of what was actually	- Injury - Illness - Environmental - Property damage	Act_Con	Dropdown list	check all that apply from the dropdown list

	impacted (e.g., injury, damage, etc.)	- Other			
6b	Potential Consequences: Descriptions of what potential impact could have been Note: List if available for events without consequence (e.g., near-misses). Otherwise, default to Actual Consequence)	- Injury - Illness - Environmental - Property damage - Other - None of the above	Pot_Con	Dropdown list	check all that apply from the dropdown list
	Process Safety Event:				
7	Process Safety Event: Unplanned or uncontrolled loss of primary containment (LOPC) from a process; undesired event or condition that could have resulted in LOPC	- Yes - No	Ps_Evt	Dropdown list	check one from the dropdown list
8	Process Safety Event Tier: Level of severity as defined by IOGP 456	- Tier 1 - Tier 2 - Tier 3 - Tier 4	Ps_Tier	Dropdown list	check one from the dropdown list
9	Location Information: Geographical Region: Description of the general area where event occurred	- Gulf of Mexico (GOM) - Offshore Pacific - Offshore Alaska - Elsewhere	Geo_Reg	Dropdown list	check one from the dropdown list (current focus is GOM only)

10	Physical Location: Water depth where event occurred	- Offshore deepwater (>1000 feet) - Offshore shelf (≤ 1000 feet) - Onshore	Phy_Loc	Dropdown list	check one from the dropdown list
	Asset and Activity Information:				
11	Asset Type: The general asset or facility where the event occurred (e.g., production, rig, marine vessel, aviation, other)	- Production + Fixed platform + FPSO + TLP + SPAR + Subsea infrastructure + Semi-submersible + Pipeline + Other - Rig + Platform rig + Semi-submersible + Jack-up + Drill ship + Barge + Intervention vessel + Other - Marine Vessel + Seismic + Offshore supply/service vessel (OSV) + Construction/installation vessel + Flotel + Crew boat + Frac boat + Dive vessel + Other - Aviation + Helicopter + Other - Shorebase - Other	Ast_Typ	Dropdown list	check one from the dropdown list

12	Operation Type: The general category of operation that was occurring at the time of the event	- Production - Drilling - Workover - Completion - Commissioning - Decommissioning - Helicopter (transportation) - Motor vessel (transportation support) - Seismic - Pipeline - Construction - Other	Op_Typ	Dropdown list	check one from the dropdown list
13	Primary Activity Type: Description of the specific activity that was being performed at the time of the event	- Confined space entry - Diving - Domestic activities - Emergency response (actual or drill) - Energy isolation (LOTO) - Helicopter flight - Helicopter landing or take-off - Hot work - Maintenance, inspection, and testing - Marine vessel - in transit - Marine vessel - station keeping - Material handling - manual - Material transfer or displacement - Mechanical lifting - Normal/routine activities - Remote operated vehicles - Simultaneous operations (SIMOPS) - Start-up or shutdown operations - Working at heights	Act_Typ	Dropdown list	check one from the dropdown list

		- Other			
14	Location on Facility: Description of specifically where on the asset or facility that the event occurred	- Shorebase facilities - Rig floor/derrick - Deck - Well control equipment - Mud/cement system - Well bay/moon pool - Accommodations - Tanks/vessels - Subsea - Helideck - Engine/generator room/ motor control center (MCC) - Process area - +10 deck - Bridge/control room - Asset structure - Life boat/fast rescue craft - Temporary scaffolding/work platforms - Other	Loc_Fac	Dropdown list	check one from the dropdown list
15	Injury Information: Injury/Illness Classification: Description of the injury or illness classification	- Fatality - Lost work/days away from work - Restricted work/job transfer - Medical treatment - First aid - Non-treatment	Inj_Ill	Dropdown list	check one from the dropdown list
16	Injured Party (IP) Type Notation if injured party was an employee, contractor, or other	- Employee - Contractor - Other	Emp_Typ	Dropdown list	check one from the dropdown list
17	Body Part: Description of the specific body part affected		Bod_Prt	Free text or drop-down	text description

18	Injury Type: Clarification regarding the type of injury that occurred	- Amputation - Burn - Concussion - Contusion - Cut - Laceration - Fracture - Sprains/strains - Other	Inj_Typ	Dropdown list	check one from the dropdown list
	Fires and/or Explosions:				
19	Fuel Type of Fire: Description of fuel that resulted in fire or explosion	Free text	Ful_Typ	Free text	text description
20	Source of Ignition: Description of the ignition source	Free text	Ign_Src	Free text	text description
21	Duration of Fire: How long did the fire last (in minutes) before being extinguished?	Numeric	Fir_Dur	Numeric	data input should be in minutes
	Loss of Primary Containment (LOPC):				
22	Material Released: Description of the material released in a LOPC event	Free text	Mat_Rel	Free text	text description
23	Release To: What was the impact of the LOPC release on the surrounding area?	- Air - Water - Land - Contained onsite	Rel_Typ	Dropdown list	
24	Onsite or Offsite? Did the LOPC release occur onsite?	- Inside 500m zone - Outside 500m zone	On_Off	Dropdown list	check one from the dropdown list

25	Reporting Volume: How much material was released?	Numeric For Phase II, specify units (e.g., barrels, kg., liters, etc.)	Rel_Vol	Numeric	
26	Property Damage: Property or Equipment Damaged: Description of the property or equipment that was damaged	Free text	Eqp_Dam	Free text	text description
27	Dropped Objects: Object Dropped: Description of the object that was dropped	Free text	Obj_Drp	Free text	text description
28	Investigation/Cause: Causal Factors: Description of the causal factors attributed to this event	Select from list of 18 possible causal factors, if at all possible	Cau_Fct	Free text	~~text description~~; should eventually tie to drop down list selections once finalized
29	Causal Factor Narrative: Description of the event circumstances	Free text	Cau_Nar	Free text	text description
30	Event Corrective Actions: Description of corrective actions taken	Free text	Cor_Act	Free text	text description; may be part of the causal factor narrative

	For future consideration:				
	Stop Work: Action by worker to halt all work when unsafe condition is observed	- yes - no	Stp_Wrk	Dropdown list	check one from the dropdown list
	Water Depth: Depth of water where offshore event occurred	Numeric	Wtr_Dpt	Numeric	May not be captured by all
	Secondary Activity Type: Description of the specific activity that was being performed at the time of the event Select if applicable and if known	- Confined space entry - Diving - Emergency response (actual or drill) - Energy isolation (LOTO) - Helicopter flight - Helicopter landing or take-off - Hot work - Maintenance, inspection, and testing - Material handling - manual - Marine vessel - in transit - Marine vessel - station keeping - Mechanical lifting - Material transfer or displacement - Normal/routine activities - Remote operated vehicles (ROVs) - Simultaneous operations (SIMOPS) - Start-up or shutdown operations - Working at heights - Other	Act_Typ	Dropdown list	check one from the dropdown list
	Is Weather A Factor?	- Yes - No	Wea_Fct	Dropdown list	check one from the

	Determination on if weather was a contributing factor to the event	- Not relevant			dropdown list
	Wave Height: Description of wave height at the time when the event occurred (in unit)	Numeric	Wav_Het	Numeric	
	Current Speed: Description of current speed at the time when the event occurred (in unit)	Numeric	Cur_Spd	Numeric	
	Current Direction: Description of current direction at the time when the event occurred	- East - North-East - North - North-West - West - South-West - South - South-East	Cur_Dir	Dropdown list	
	Wind Speed: Description of wind speed at the time when the event occurred (in unit)	Numeric	Win_Spd	Numeric	
	Wind Direction: Description of wind direction at the time when the event occurred	- East - North-East - North - North-West - West - South-West - South - South-East	Win_Dir	Dropdown list	
	Water Temperature: Description of water temperature at the time when the event occurred (in unit)	Numeric	Wat_Tem	Numeric	

	Air Temperature: Description of air temperature at the time when the event occurred (in unit)	Numeric	Air_Tem	Numeric	
	Job Title: The job title of the injured party	Free text	Job_Typ	Free text	text description
	Job Category: All job titles are classified into two categories, supervisor or worker	- Supervisor - Worker	Job_Cat	Dropdown list	check one from the dropdown list
	Short Service Employee: Was injured party classified as a short service worker?	- Yes - No	SSE_Wrk	Dropdown list	check one from the dropdown list
	Experience: What was the worker's experience with the company in years?	Numeric	Exp-Yrs	Numeric	None
	Day of Hitch:	- Monday - Tuesday - Wednesday - Thursday - Friday - Saturday - Sunday	Day_Hch	Dropdown list (if deemed necessary in addition to event date)	check one from the dropdown list
	Evacuation: Did evacuation require evacuation of the work area?	- Yes - No	Eva_Rqd	Dropdown list	check one from the dropdown list
	Body Subpart: Further clarification of the specific body part affected	Free text	Bod_Sub	Free text or drop-down list	text description
	Position: Description of the injured	Free text	Bod_Pos	Free text	text description

	party's body position at the time of the incident				
	Method of Extinguishment: Description of how fire was extinguished	Free text	Ext_Met	Free text	text description
	Hazard Area Classification: Description of the hazard classification for the area where the fire occurred	Free text	Haz_Cls	Free text	text description
	Temporary Equipment? Did the fire occur in the area where temporary equipment was installed and/or in use?	- Yes - No	Tmp_Eqp	Dropdown list	check one from the dropdown list
	LOPC Type: Description of the Loss of Primary Containment (LOPC) event	Free text	LOP_Typ	Free text	text description
	Secured or Continuous? Was the material release secured?	- Yes - No	Sec_Con	Dropdown list	check one from the dropdown list
	Was the release contained?	- Yes - No	Rel_Con	Dropdown list	check one from the dropdown list

		- Partial			
	Extent of Damage: Description that clarifies that extent of the damage	Free text	Dam_Dsc	Free text	text description
	Damage Cost: Cost estimate of the damage incurred in dollars	Numeric	Dam_Cst	Numeric	numeric value in dollars
	Object Lost Overboard? Was the object dropped overboard?	- Yes - No	Obj_Ovr	Dropdown list	check one from the dropdown list
	Dropped Object Recovered?	- Yes - No	Obj_Rec	Dropdown list	check one from the dropdown list
	Drops Classification: Description of severity of potential consequence per industry chart that plots weight of object vs. distance dropped	Numeric	Drp_Cls	Numeric	potential consequence of drop based on chart of weight vs. distance dropped

Appendix B: Causal Factor Definitions

Select one or more of the following causal factors, as applicable, that were identified as possibly to contributing to the event that was noted (either with or without consequences).

Physical Facility, Equipment and Process

- **Process or Equipment Design or Layout -** The design or layout of the process or equipment were potentially significant contributors to subsequent human actions.
- **Process or Equipment Material Specification, Fabrication and Construction -** The compatibility of the material specification, fabrication or construction prior to its use was a possible cause, including the process or equipment provided by vendors or third parties on a permanent or temporary basis. This category includes the use of defective parts or equipment, or improper installation.
- **Process or Equipment Reliability -** Relates to the ability of the process or equipment to function without defects or breakdown, including improvements in maintenance, inspection, testing and operating requirements.
- **Instrument, Analyzer and Controls Reliability -** Relates to the ability of instrumentation, analyzers, and control systems, including software, to function without defects or breakdown, as well as improvements in maintenance, inspection, testing and operating requirements.

Administrative Processes

- **Risk Assessment and Management -** The process for systematic identification and evaluation of potentially significant risks, including but not limited to Hazard and Operability (HAZOP) studies, facility hazard assessments, and Job Safety Analyses (JSA).
- **Operating Procedures or Safe Work Practices -** An improvement opportunity involves creating or modifying operating procedures or safe work practices to prevent recurrence, including specific operations, maintenance, testing, contractor selection or other procedures and practices.
- **Management of Change (MOC) -** The process for identifying, approving, and managing significant technical, administrative or organizational changes, including instances where MOC use was not required but should have been, the MOC review was incomplete or incorrect, or MOC actions were not completed (e.g., drawings were not updated).

- **Work Direction or Management -** The process for directing work activities or managing the number or types of work allowed at a given time or location, including but not limited to permit-to-work, simultaneous operations and supervision of the area or work team.
- **Emergency Response -** The capability or processes for responding to a situation to prevent the escalation of incident or event consequences may be inadequate, such as emergency preparedness, access to equipment and trained personnel, and insufficient or absence of drills.

PEOPLE

- **Personnel Skills or Knowledge -** Personnel knowledge of the relevant tasks, or the ability of personnel to execute the task correctly and safely, may be inadequate, including gaps in training (e.g., not required, not completed, or training needs improvement), assessment/verification (not performed, needs improvement, etc.), or remediation (not required, not completed, etc.).
- **Quality of Task Planning and Preparation -** Personnel planning and preparation of the task prior to initiating the activity may need improvement, including team actions such as reviewing procedures, and completing JSAs, toolbox talks, or job walkthroughs. This category will often apply when appropriate procedures were in place, but personnel failed to follow them in the pre-work planning phase.
- **Individual or Group Decision-Making -** Decisions made by one or more people involved in the execution of the task may need improvement. This causal factor would only apply if personnel involved in the task had sufficient skills and knowledge but chose to execute the task in a manner different than the documented procedure or practice.
- **Quality of Task Execution -** The quality or thoroughness of executing the intended task procedure or practice may be questionable, including instances where the person or personnel were attempting to follow the prescribed procedures or practices, but errors or incomplete execution contributed to the incident or event.
- **Quality of Hazard Mitigation -** A person or personnel either failed to put in place barriers, or the quality, number, or location of barriers were insufficient to mitigate the potential impacts of relevant hazards.
- **Communication -** The effectiveness of communication needs improvement, including communication between team members and between the team and other individuals or groups, as well as difficulties with language or terminology.

- **Human Factors -** The interaction and application of scientific knowledge about people, facilities and management systems to improve their interaction in the work place and reduce the likelihood and/or consequences of human error. Human factors encompass both hardware and software and may also include ergonomics.
- **Human Performance -** Human performance focuses on an individual's performance given the organizational framework and performance support systems, documented procedures and practices, and competency. It presumes that the individual involved has the requisite skills and knowledge to complete a task but may choose to act otherwise or does not exhibit personal accountability.
- **Leadership -** The commitment to safety and active engagement of leaders at all levels of the organization and work team impacts safety performance, including establishing a work environment that promotes personnel sharing concerns, mistakes, and observations as opportunities to learn and improve. Effective leadership also allows personnel to feel that the information they share is respected and trusted as an accurate reflection of the situation.

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Appendix C: Glossary of terms

Notes: The source for each term is indicated in parentheses at the end of each definition.

Accommodations - This definition includes living quarters, galley, offices, and laundry. (SafeOCS)

Activity Type - A description of the specific activity that was being performed at the time of the safety event. See Appendix A for detailed list. (SafeOCS)

Asset Type - The location where the safety event occurred, including platforms, drilling rigs, support vessels, and subsea infrastructure components. Specific subcategories for each include:

- Production
  - Fixed platform
  - Floating production, storage and offloading (FPSO)
  - Tension leg platform (TLP)
  - SPAR
  - Subsea infrastructure
  - Semi-submersible (moored or dynamically positioned)
  - Pipeline
- Rig
  - Platform rig
  - Semi-submersible
  - Jack-up
  - Drill ship (moored or dynamically positioned)
  - Barge
  - Intervention vessel
- Marine Vessel
  - Seismic
  - Offshore supply/service vessel (OSV)
  - Construction/installation vessel
  - Flotel
  - Crew boat
  - Frac boat
  - Dive vessel
- Aviation
  - Helicopter
- Shorebase

Automated Safety Instrumented System - A system implementing one or more safety functions, with specified safety integrity level(s), that detect abnormal process conditions and take automatic, necessary actions to achieve or maintain a safe state for the process with respect to a hazardous event. (Center for Offshore Safety (COS))

Automatic Fire Detection System - A system to alert personnel of the existence of a fire

condition and to allow rapid identification of the location of the fire. The system may be used to automatically activate emergency alarms, initiate emergency shutdown (ESD), isolate fuel sources, start fire water pumps, shut -in ventilation systems, and activate fire extinguishing systems such as gaseous agents, dry chemical, foam, or water. (COS)

Aviation Accident - An occurrence associated with the operation of an aircraft which, in the case of manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked or, in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down.(International Association of Oil & Gas Producers (IOGP))

Bilge/Ballast System - The vessel structure, machinery, piping, or controls related to ballast movement, watertight integrity and stability. (COS)

Blowdown System - A collection of controls, valves, and pipes that allow controlled depressurization of liquid or gas pressure contained within a process, piping, or pressure vessel to reduce or eliminate pressure-induced stresses during a time of potential heat weakening of vessels and piping, and to reduce the inventory of fuel present on the facility. (COS)

Blowout Preventer and Intervention System - Equipment installed on the wellhead or wellhead assemblies to contain wellbore fluids in the annular space between the casing and the other tubular equipment, in the tubular equipment, or in an open hole during well drilling, completion, and testing operations. For the purposes of safety performance indicator (SPI) data collection, this also includes pressure control equipment used in intervention operations, such as wireline and coiled-tubing, blowout preventers (BOPs), and lubricators. (COS)

Christmas Tree - Equipment attached to the uppermost connection of the wellhead or tubing spool to contain wellbore fluids in both the tubing and in the annular space between the casing and tubing during producing operations. The subsea tree may provide locations where nitrogen and chemical additives can be injected into the annulus or tubing string. The tree consists of assembled equipment that includes a wellhead connector, valves, choke, tree cap, and control system to operate the various components. (COS)

Collision (Vessel) – The act of a moving vessel (including an aircraft) striking another vessel, or striking a stationary vessel or object (e.g., boat striking a drilling rig or platform). (30 CFR 250.188(a)(6)

Commissioning (as a work activity) - Activities following the construction, fabrication and installation of equipment, facilities or plant, designed to verify design objectives or specification and achieve a successful start-up of the facilities or plant. (SafeOCS)

Company - Oil and gas companies, also called exploration and production, or E and P companies, seek the subsurface hydrocarbon resource. These companies range in size, from smaller independent operators targeting a specific land play, such as US shale, to publicly-traded super-majors with operations worldwide, both onshore and offshore. The role of E and P companies is to produce oil or gas for refining into fuels and other useful products or to power electrical plants. (International Association of Drilling Contractors (IADC))

Construction (as a work function) - Major construction, fabrication activities and also disassembly, removal and disposal (decommissioning) at the end of facility life. Includes construction of process plant, yard construction of structures, offshore installation, hook-up and commissioning, and removal of redundant process facilities. (International Association of Oil & Gas Producers (IOGP))

Contractor - An individual or organization performing work for the reporting company, following verbal or written agreement. Subcontractor is synonymous with contractor. (IOGP)

Critical Equipment - Equipment and other systems determined to be essential in preventing the occurrence of or mitigating the consequences of an uncontrolled release. Such equipment may include vessels, machinery, piping, blowout preventers, wellheads and related valving, flares, alarms, interlocks, fire protection equipment and other monitoring, control and response systems. (American Petroleum Institute (API) RP 75)

Critical Service Provider - Those companies or persons involved in any phase of offshore operations on the Outer Continental Shelf on behalf of leaseholders, designated operators, or drilling contractors *who, by the nature of the service they provide, are involved in the construction, start-up and operation of facilities, inspection, testing, installation, maintenance, repair, or decommissioning of*

any part of an essential piece of critical equipment or critical process.

Days Away from Work Case - A case where a physician or other licensed health care professional recommends days away from work in connection with a work-related injury or illness. (API RP 75)

DART - An acronym standing for Days Away, Restricted Work or job transfer. (API RP 75)

Deck - For purposes of SafeOCS, this broad category includes all work areas on an offshore facility, such as cranes/lifting equipment, workshops, welding areas, warehouse/storage room, and machinery rooms. It excludes the rig floor/derrick, process area, accommodations, subsea infrastructure, bridge/control room, engine/generator room, motor control center, helideck, and +10 deck. (SafeOCS)

Decommissioning – Activities associated with the disassembly, removal and disposal of facility or plant assets at the end of the asset life. For purposes of SafeOCS, this is considered separate for activities associated with plugging and abandoning (P&A) or temporarily abandoning (TA) a well. (SafeOCS)

Domestic Activity – Events resulting from typical activities in the living accommodations of an oil and gas facility. The scope of these activities includes, but is not limited to, those associated with areas for sleeping, laundry, recreation, and cooking. (SafeOCS)

Downhole Safety Valve - A device installed in a well below the wellhead with the design function to prevent uncontrolled well flow when actuated — e.g., subsurface controlled safety valve (SSCSV) or surface controlled subsurface safety valve (SCSSV). An SSCSV is a subsurface safety valve actuated by the pressure characteristics of the well. An SCSSV is a subsurface safety valve controlled from the surface by hydraulic, electric, mechanical, or other means. (COS)

Drilling (as a work function) - All exploration, appraisal and production drilling and workover as well as their administrative, engineering, construction, materials supply and transportation aspects. It includes site preparation, rigging up and down and restoration of the drilling site upon work completion. Drilling includes ALL exploration, appraisal and production drilling. (IOGP)

Drilling Contractor - Drilling contractors provide the rigs and personnel required to drill the

wells for oil and gas Companies, the operators, who will ultimately produce oil and gas. Drilling contractors also provide the engineering and the oversight of the drilling of the wells, including putting the well in place and setting up all the equipment in place so that an oil company can come in, put its own production platform and rig in place that will be used through the life of the field. (IADC)

Drilling/Workover/Well Services (as a type of activity) - Activities involving the development, maintenance work or remedial treatments related to an oil or gas well, including intervention. (IOGP)

Environmental – Includes, but is not limited to, impacts to air, sea, or land as a result of an event. (SafeOCS)

Equipment Collision – Events which involve an object striking equipment (e.g., a suspended load striking a handrail). Note, however, that dropped objects that strike equipment or land on the deck are not considered equipment collisions. (SafeOCS)

Event - An unplanned or uncontrolled outcome of a business operation or activity that has or could have contributed to an injury or physical damage or environmental damage. (IOGP)

Event Category - A description of the general type of event that occurred, including: (SafeOCS)

- Personal safety event
- Dropped object/material overboard
- Well control
- Fire
- Explosion
- Process safety event
- LOPC (e.g., gas release, spill)
- Collision (includes both vessel and equipment collisions)
- Station keeping
- Muster
- H_2S
- Non-work related
- Other

Event Type - For purposes of SafeOCS ISD, safety events are categorized as one of the following three types: (SafeOCS)

- Incident occurred, with consequences (e.g., lost time, restricted work/job transfer, medical treatment, first aid, agency reportable)
- Event occurred, but no consequences (e.g., near-misses, near hits)
- No event; proactive/preemptive action based on observation of potentially unsafe conditions (e.g., stop work, unsafe action or condition); excludes behavior-based or peer-to-peer observations

Exploration (as a work function) - Geophysical, seismographic and geological operations, including their administrative and engineering aspects, construction, maintenance, materials supply, and transportation of personnel and equipment; excludes drilling. (IOGP)

Explosion - A release of energy that causes a pressure discontinuity or blast wave (e.g. detonations, deflagrations, and rapid releases of high pressure caused by rupture of equipment or piping). (API 754)

Exposure - Noise, Chemical, Biological, Vibration (as an incident/event category) - Exposure to noise, chemical substances (including asphyxiation due to lack of oxygen not associated with a confined space), hazardous biological material, vibration or radiation. (IOGP)

Facility - Wells, structures, living quarters, drilling and workover packages, process equipment, utilities, pipelines, and mobile offshore units. (API RP 75)

Fire - As used in 30 CFR 250.188(a)(4), Fire means a rapid persistent chemical change that releases heat and light and is accompanied by flame, especially the exothermic oxidation of a combustible substance. (BSEE NTL 2008-G17)

Fire Water System - A system composed of the fire water pump, the distribution piping, the hose, nozzle, and the deluge sprinkler system which is used to provide exposure protection, control of burning, or extinguishment of fires. (COS)

First Aid Treatment - Any medical treatment rendered by a physician or other licenses health care professional beyond what is detailed below renders the work-related event Recordable. (API RP 75) First Aid Treatment is limited to the following:

- Non-prescription medication at non-prescription strength;
- Tetanus immunization;
- Cleaning, flushing or soaking wounds on the surface of the skin;
- Using wound coverings such as Band-Aid, bandages, gauze pads, etc.; or using butterfly bandages or Steri-Strips;

- Using hot or cold therapy;
- Using any non-rigid means of support such as elastic wraps, bandages, non-rigid back belts, etc.;
- Using temporary immobilization devices for transporting an injured person;
- Drilling a fingernail to relieve pressure or draining fluid from a blister;
- Using eye patches;
- Removal of foreign bodies from the eye using only irrigation or a cotton swab;
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
- Using finger guards;
- Using massages (not physical therapy or chiropractic treatment); or
- Drinking fluids for relief of heat stress.

Fixed Fire-Fighting System - Includes fire water pumps and drivers, distribution piping, fire hoses, stations, nozzles, water spray systems, monitors, foam systems (fixed or portable), dry chemical systems, gaseous systems (e.g., CO2, Halon, FM-200, FE-13, Inergen), and water mist or fine water spray systems. (COS)

Flare System - The use of combustion to safely dispose of relief gases in an environmentally compliant manner. (COS)

Gas Detection System - A system to alert personnel to the presence of flammable gases, toxic gases, or a combination of both. (COS)

Geographic Location - The physical location of the facility that the safety event data applies to. (SafeOCS)

Hazard Analysis - The application of one or more methodologies that aid in identifying and evaluating hazards. (API RP 75)

High Potential Event - Any incident or near-miss that could have realistically resulted in one or more fatalities. (IOGP)

High Value Learning Event - Any HSSE or operational incident or event where the most serious probable outcome is a Major Incident; an event that identifies: (COS)

- A previously unknown risk, situation, operational or mechanical hazard, or barrier failure
- A previously unknown combination of factors that resulted in an unexpected condition or event
- A routine operation or activity that created a previously unidentified risk or consequence
- A situation where established industry designs, controls, or procedures failed to prevent an event

- An event that is part of a pattern in industry events that could indicate that certain hazardous conditions are not well-understood.

Human Factors - The interaction and application of scientific knowledge about people, facilities and management systems to improve their interaction in the work place and reduce the likelihood and/or consequences of human error. Human factors encompass both hardware and software and may also include ergonomics. (API RP 75/SafeOCS)

Injury/Illness Classification - For purposes of SafeOCS data capture, injuries and illnesses will be categorized as one of the following: (SafeOCS)

- Fatality
- Lost work/days away from work
- Restricted work/job transfer (RW/JT)
- Medical treatment
- First aid
- Non-treatment

Injury Type - For purposes of SafeOCS data capture, injuries will be categorized as one of the following: (SafeOCS)

- Amputation
- Burn
- Concussion
- Contusion
- Cut/laceration
- Fracture
- Sprains/strains

Launch and Recovery Systems - Systems used to deploy or retrieve a lifeboat, life raft, or rescue boat. (COS)

Lifeboat/Survival Craft - A craft capable of sustaining the lives of persons in distress from the time of abandoning the ship. (COS)

Life Raft - An inflatable appliance which depends upon non-rigid, gas-filled chambers for buoyancy and which is normally kept uninflated until ready to use. (COS)

Loss of Primary Containment (LOPC) - An unplanned of uncontrolled release of any material from primary containment, including non-toxic and non-flammable materials (e.g. steam, hot condensate, nitrogen, compressed CO_2 or compressed air) For drilling operations, any unplanned or uncontrolled release to the surface (seabed or ground level) should be included.

(IOGP 456)

Loss of Station Keeping Resulting in Drive Off or Drift Off - A malfunction or improper operation of the DP system. (COS)

Lifeboat, Life Raft, or Rescue Boat Event - A recordable injury or equipment damage or malfunction during lifeboat, life raft, or rescue boat operations or that takes the craft out of service. (COS)

Maintenance, inspection and testing (as a type of activity) - Activities related to preserving, repairing, examining and function testing assets, equipment, plant or facilities. (IOGP)

Material Transfer or Displacement - The act of transferring fluid from one point or location on the asset to another. (SafeOCS)

Major Incident - An incident that has resulted in multiple fatalities or serious damage, possibly beyond the asset itself. Typically initiated by a hazardous release but may also result from major structural failure or loss of stability that has caused serious damage to an asset (note: this is intended to incorporate terms such as 'Major Accident' as defined by UK Health and Safety Executive (HSE). (IOGP)

Mechanical Lifting - A mechanical lifting (or lowering) of asset or personnel (i.e., personnel transfer or man-riding) event that results in one or more of the following consequences: (SafeOCS)

- Injuries in a single incident that occurs during the lift
- Direct damage to or loss of an asset (including the load itself)
- A loss of primary containment of a material
- A dropped load that strikes live process equipment

Mobile Offshore Drilling Unit (MODU) - A vessel capable of engaging in drilling or well workover operations for the exploration or exploitation of subsea resources. (API RP 75)

Mobile Offshore Unit (MOU) - A vessel which can be readily located to perform an industrial function related to offshore oil, gas, or sulfur exploration or exploitation. Such vessels include mobile offshore drilling units (MODUs), lift boats and other units involved in construction, maintenance (including maintenance of wells) and lifting operations associated with offshore

facilities. Mobile offshore units normally do not include vessels such as: supply vessels, standby vessels, anchor handling vessels, or seismic survey vessels. (API RP 75)

Mud/Cement System - All facilities/equipment related to the mud/cement systems, including hydraulic system, BOP accumulator room, mud pit room, filtration unit, mud logging unit, cement mixing tank, and shaker room. (SafeOCS)

Muster – Movement of people to a designated area so that the person in overall charge can account for all people and thereby facilitate subsequent emergency response actions. (ISO 15544:2000)

Near-Miss - An unplanned or uncontrolled event or chain of events that has not resulted in recordable injury or physical damage or environmental damage but had the potential to do so in other circumstances. (IOGP)

Non-work-related - An injury or illness is considered non-work-related (and therefore excluded from SafeOCS ISD analysis) if it meets one or more of the criteria detailed in OSHA 1904.5(b)(2).

Normal/Routine Activities – This activity should be selected when none of the more specific activities listed do not apply. Production, drilling, and other activities that are occurring consistent with documented or expected practices consistent with the appropriate design parameters of the asset. In the case of equipment, it is generally considered normal conditions when it conforms electrically and mechanically with its design specifications and is used within the limits specified by the manufacturer. (SafeOCS/API RP 14FZ for equipment)

Occupational Illness - Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. Occupational illness may be caused by inhalation, absorption, ingestion of, or direct contact with the hazard, as well as exposure to physical and psychological hazards. It will generally result from prolonged or repeated exposure. Refer to the latest IOGP/IPIECA *Health leading performance indicators* report. (IOGP)

Off-Shift Events – An injury or illness event is considered off-shift if it occurs during off-hours in the accommodations section of an offshore facility or prior to an offshore worker leaving a

shorebase either via marine vessel or helicopter, even if some of these events may be classified as non-work related per OSHA regulations and excluded from this report. (SafeOCS)

Offshore Work - All activities and operations that take place at sea, including activities in bays, in major inland seas, such as the Caspian Sea, or in other inland seas directly connected to oceans. Incidents including transportation of people and equipment from shore to the offshore location, either by vessel or helicopter, should be recorded as 'offshore'. (IOGP)

Operation Type - The general category of operation that was occurring at the time of the safety event: (SafeOCS)

- Production
- Drilling
- Workover
- Completion
- Commissioning
- Decommissioning
- Helicopter (transportation)
- Motor vessel (transportation or support)
- Pipeline
- Seismic
- Construction

Operator - The individual, partnership, firm, or corporation having control of management of operations on the leased area or a portion thereof. The operator may be a lessee, designated agent of the lessee(s), or holder of operating rights under an approved operating agreement. (API RP 75)

Owner - The individual, partnership, firm, or corporation to whom the United States issues a lease and has been assigned an obligation to make royalty payments required by the lease. (API RP 75)

Physician or Other Licenses Health Care Professional - An individual whose legally permitted scope of practice (i.e., license, registration or certification) allow him or her to independently perform or be delegated the responsibility to perform medically-related treatment. This includes, but is not limited to: (API RP 75)

- Physicians;
- Nurses;
- Physical and Occupational Therapists;

- Medics; or
- Chiropractors.

Personal Safety - Refers to the freedom from physical harm or threat of physical harm resulting from one or more hazards or unsafe behaviors. Examples include slips, trips, falls, cuts, and vehicle accidents. Personal safety event could involve one or more individuals. (SafeOCS)

Pipeline - A transportation system used to move a variety of products such as natural gas, liquid petroleum products, and process fluids as part of an oil and gas exploration, drilling, or production system. (SafeOCS)

Piping - An assembly of interconnected pipes that are used to convey, distribute, mix, separate, discharge, meter, control, or snub flows of hydrocarbons or toxic and hazardous chemicals. (COS)

Plug & Abandon – Placement of a cement plug in a well, in which no future utility has been identified, to seal the entire wellbore against fluid migration, and protect fresh water aquifers from contamination. (API)

Pressure Relief Device - A device actuated by inlet static pressure and designed to open during emergency or abnormal conditions to prevent a rise of internal fluid pressure in excess of a specified design value. The device may also be designed to prevent excess internal vacuum. The device may be a pressure relief valve, a non-reclosing pressure relief device, or a vacuum relief valve. (COS)

Primary Activity Type - Description of the specific activity that was being performed at the time of the safety event. Examples of specific activities, including specially permitted activities, are provided in Appendix A.

Primary Containment - A tank, vessel, pipe, truck, rail car, or other equipment designed to keep a material within it, typically for purposes of storage, separation, processing or transfer of gases and liquids. The terms vessel and pipe are taken to include containment of reservoir fluids the casing and wellhead valving to the surface. (IOGP 456)

Process Area - The systems for production, use, storage, handling, treatment, or movement of hydrocarbons, sulfur, or toxic substances, including the fuel gas system, port bunkering system,

cooling system, pump stations, production water treatment system, cooling water systems, water injection system, export system, and utility systems. (SafeOCS)

Process Equipment and Pressure Vessels - A container associated with drilling, production, gathering, transportation, and treatment of liquid petroleum, natural gas, natural gas liquids, or associated salt water (brine) designed to withstand internal or external pressure above ambient conditions. Also included are containers used for pressurized storage of toxic and hazardous chemicals. (COS)

Process Safety - A disciplined framework for managing the integrity of operating controls handling hazardous substances. It is achieved by applying good design principles, engineering, and operating and maintenance practices. It deals with the prevention and control of events that have the potential to release hazardous materials and energy. Such incidents can result in toxic exposures, fires, or explosions, and could ultimately result in serious incidents including fatalities, injuries, property damage, lost production, or environmental damage. (IOGP)

Process Safety Event (PSE) - An unplanned or uncontrolled LOPC of any material including non-toxic and nonflammable materials (e.g. steam, hot condensate, nitrogen, compressed CO2, or compressed air) from a process, or an undesired event or condition that, under slightly different circumstances, could have resulted in an LOPC of a material. (IOGP 456, as amended)

- **Tier 1 PSE -** Loss of primary containment (LOPC) with the greatest consequence. A Tier 1 PSE is an unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, compressed air), from a process that results in one or more of the consequences listed below:
    - An employee, contractor, or subcontractor "days away from work" injury and/or fatality
    - A hospital admission or fatality of a third party
    - An officially declared community evacuation or community shelter-in-place
    - A fire or explosion resulting in greater than or equal to USD 100,000 of direct cost to the Company
    - A pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences:

    - rainout
    - discharge to a potentially unsafe location
    - an onsite shelter-in-place
    - public protective measures (e.g., road closure) and a PRD discharge quantity greater than the threshold quantities described within IOGP 456 Appendix B in any one-hour.
  - A release of material greater than the threshold quantities described in IOGP 456 Appendix B in any one-hour period.
- **Tier 2 PSE -** LOPC with lesser consequence. An unplanned or uncontrolled release of any material, including nontoxic and nonflammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, compressed air), from a process that results in one or more of the consequences listed below and is not reported as a Tier 1 PSE:
  - An employee, contractor, or subcontractor recordable injury
  - A fire or explosion resulting in greater than or equal to USD 2,500 of direct cost to the Company
  - A pressure release device (PRD) discharge to atmosphere whether directly or via a downstream destructive device that results in one or more of the following four consequences:
    - rainout
    - discharge to a potentially unsafe location
    - an onsite shelter-in-place
    - public protective measures (e.g., road closure)
    - and a PRD discharge quantity greater than the threshold quantities described within IOGP 456 Appendix B in any one-hour.
  - A release of material greater than the threshold quantities described in IOGP 456 Appendix B in any one-hour period.
- **Tier 3 PSE -** Captures an operational situation, typically considered a 'near-miss', which has challenged the safety system by progressing through one or more barrier weaknesses to result in an event or condition with
  - Consequences that do not meet the criteria for a reportable Tier 1 or Tier 2 event; or
  - No actual consequences, but the recognition that, in other circumstances, further barriers could have been breached and a Tier 1 or Tier 2 event could have happened.

  Types of Tier 3 events could include numerical data or other parameters related to:

- Demands on safety systems, e.g. pressure relief devices
- Safe operating limit excursions
- Primary containment inspection or testing results outside acceptable limits
- LOPC below Tier 2 thresholds
- Near-misses with potential for LOPC
- Asset integrity/process safety audit findings indicating barrier weaknesses
- Non-compliances with asset integrity or process safety voluntary standards or legislation

- **Tier 4 PSE -** Captures performance of individual risk control barriers, or its components, within a facility's management system, and operating discipline. These KPIs are typically more leading and pro-active because they reflect activities of the company directly associated with maintaining and improving its risk control barriers.

MEASURES CAN BE FOCUSED ON BARRIERS SUCH AS:

- Engineering and inherently safe design
- Equipment maintenance, inspection and testing
- Process hazard and major incident risk assessments
- Quality of, and adherence to, operating procedures
- Facility management of change
- Contractor capability and management
- Audit improvement actions
- Asset integrity and process safety initiatives
- Workforce and management training and development
- Technical competence assessment and assurance

Production (as a work function) - Petroleum and natural gas producing operations, including their administrative and engineering aspects, minor construction, repairs, maintenance and servicing, materials supply, and transportation of personnel and equipment. It covers all mainstream production operations including wireline. Gas processing activities with the primary intent of producing gas liquids for sale including: (IOGP)

- Work on producing or injection wells under pressure
- Oil (including condensates) and gas extraction and separation (primary production)
- Heavy oil production where it is inseparable from upstream (i.e. steam assisted gravity drainage) production

- Primary oil processing (water separation, stabilization)
- Primary gas processing (dehydration, liquids separation, sweetening, CO2 removal)
- Floating Storage Units (FSUs) and sub-sea storage units
- Gas processing activities with the primary intent of producing gas liquids for sale
    - Secondary liquid separation (i.e. Natural Gas Liquids [NGL] extraction using refrigeration processing)
    - Liquefied Natural Gas (LNG) and Gas to Liquids (GTL) operations
- Flowlines between wells and pipelines between facilities associated with field production operations
- Oil and gas loading facilities, including land or marine vessels (trucks and ships) when connected to an oil or gas production process
- Pipeline operations (including booster stations) operated by company oil and gas business. The production work function excludes:
- Production drilling or workover operations
- Mining processes associated with the extraction of heavy oil tar sands
- Heavy oil when separable from upstream operations
- Secondary heavy oil processing (upgrader)
- Refineries.

Property or equipment damage - The cost of labor and material to restore all affected items to their condition before the damage, including, but not limited to, the OCS facility, a vessel, helicopter, or equipment. It does not include the cost of salvage, cleaning, gas-freeing, dry docking, or demurrage. For purposes of SafeOCS, this definition includes all damage regardless of dollar threshold. (30 CFR 250.188(a)(6)/SafeOCS)

Production operations (as a type of activity) - Activities related to the extraction of hydrocarbons from source such as an oil or gas well or hydrocarbon bearing geological structure, including primary processing, storage and transport operations. Includes normal, start-up or shut-down operations. (IOGP)

Recordability - All injuries/illnesses that are work-related shall be considered Recordable if it results in death, days away from work, restricted work or transfer to another job, medical treatment beyond First Aid, loss of consciousness or if it involves a significant injury or illness. (API RP 75)

Rescue Boat - A boat designed to rescue persons in distress and to marshal survival craft. (COS)

Restricted Work/Job Transfer Case - A work-related injury/illness that prevents the person from working a full shift or the person is restricted by a physician or other licensed health care professional from performing any or all of the routine job functions which are performed at least once per week. As an alternative and based on the recommendations of a physician or other licensed health care professional, the injured party may also be moved to a different job position or assignment. (API RP 75)

Rig Processing/Derrick - For purposes of SafeOCS, this classification includes the top drive, cantilever, main side draw works, diverter, upper choke manifold, drill floor/driller's cabin, and catwalk. It excludes the engine/generator room. (SafeOCS)

Rupture Disk - A pressure-containing, pressure-and temperature-sensitive element of a rupture disk device. A rupture disk device is a non-reclosing pressure relief device actuated by static differential pressure between the inlet and outlet of the device and designed to function by the bursting of a rupture disk. The device includes a rupture disk and a rupture-disk holder. (COS)

Secondary Containment - An impermeable physical barrier specially designed to prevent release into the environment of materials that have breached primary containment. Secondary containment systems include, but are not limited to, tank dykes, curbing around process equipment, drainage collection systems into segregated oily drain systems, the outer wall of double walled tanks, etc. (IOGP 456)

Service Company - Oilfield service companies provide a large range of services and applications, from drilling and formation evaluation, well construction, completion and stimulation and artificial lift or production at the end of the well program. Service companies play a role in terms of providing people and technology, as well as the investment that they make in technology as well. The size and scope of oilfield service companies also varies, from larger firms that may offer more than 30 different services, to smaller groups that specialize in a single service. (IADC)

Shorebase - Onshore support facilities that provide such services as a receiving and transshipment point for materials. It is the place where a worker reports to before being

transported offshore. This facility includes the heliport, yard, warehouse, fabrication yards, docks, and other land-based facilities/equipment used in support of offshore activities (e.g., onshore transportation). For purposes of SafeOCS, marine vessels tied to dock (i.e., not yet in transit) and helicopters while still on the ground (i.e., prior to lift-off) are considered part of the shorebase. (SafeOCS)

Shutdown System - A system of manual stations that, when activated, will initiate the shutting in (isolation and cessation) of all process stations of a platform production process and all support equipment for the process. It may also be integrated with fire and gas detection systems for automatic initiation. (COS)

Simultaneous Operations (SIMOPS) **-** Two or more of the following activities: production, drilling, completion, workover, wireline (except routine operations), and major construction operations. (API RP 75)

Station Keeping Systems - Typically a single point mooring, a spread mooring, vertical tension legs, or a Dynamic Positioning system used to achieve reliable position keeping capability of a floating structure or vessel. (COS)

Stop Work Authority - Stop work authority gives personnel the responsibility and authority to require that all work be halted when a dangerous condition is observed. (BSEE)

Structure/Collision - This definition includes platform/hull substructure, rig tensioners, ballast tanks, and bilge system. (SafeOCS)

Subsea – This broad category addresses includes all facilities, equipment, and infrastructure below the water line, including remote operated vehicles (ROVs). (SafeOCS)

Uncontrolled Release - An accidental release of hydrocarbons, toxic substances, or other materials that is likely to develop quickly, be outside the anticipated range of normal operations, present only limited opportunity for corrective action, require any action to be in the nature of an emergency response, and could result in serious environmental or safety consequences. (API RP 75)

Weather Factors - For purposes of metadata data analysis, weather factors of interest include:

(SafeOCS)

- Wave height
- Current speed & direction
- Wind speed & direction
- Water temperature
- Air temperature
- Not relevant

Well Pressure Containment System - The equipment below the blowout preventer (BOP) or Christmas tree that provides the ability to contain pressure when a BOP or Christmas Tree has been closed. It includes the casing and wellhead (with cement support and isolation where applicable) and tubing, tubing hardware, and tubing hanger. (COS)

Well Control – Methods used to minimize the potential for the well to flow or kick and to maintain control of the well in the event of flow or a kick. Well control applies to drilling, well completion, well workover, abandonment, and well service operations. It includes measures, practices, procedures and equipment, such as fluid flow monitoring, to ensure safe and environmentally protective drilling, completion, abandonment, and workover operations as well as the installation, repair, maintenance, and operation of surface and subsea well control equipment. (30 CFR 250)

Well Control Equipment – Systems and subsystems (components, parts, or assemblies) that are used to control pressure within the wellbore. This category includes the BOP (top side), BOP accumulator room, wellhead, and chemical room/mixing area. It excludes subsea equipment and the moon pool/well bay. (API Standard 53)

Well Work – See "Drilling/Workover/Well Services."

Work-Related - An injury or illness is presumed to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. (API RP 75)
Exceptions include:

- Visitors or members of the public;
- Voluntary participation in a wellness program such as the use of company-provided exercise

equipment;

- Eating, drinking or preparing one's own food;
- Cold or flu;
- Personal tasks outside working hours;
- Personal grooming, self-medication or self-infliction;
- Symptoms arising on site solely due to outside factors; or
- Motor vehicle accident during commute, provided the injured party is not within course and scope of employment.