Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

March 20, 2009

Mr. Chris Hoidal
Director, Western Region
Pipeline and Hazardous Materials Safety Administration
12300 W. Dakota Avenue, Suite 110
Lakewood, CO 80228

Reference: Notice of Amendment
CPF 5-2009-5010M

Dear Mr. Hoidal:

This letter responds to the Notice of Amendment (NOA) letter dated February 19, 2009, to Mr. Thomas Simmons, the Hawaiian Electric Company, Inc. (HECO) Vice President – Power Supply, from the Pipeline and Hazardous Materials Safety Administration (PHMSA) regarding HECO's Iwilei Pipeline System in Honolulu, Hawaii. The NOA raises three issues identified by a PHMSA inspector in connection with the July 29-30, 2008 inspection of the Pipeline System records and Integrity Management Program (IMP). HECO received the NOA on February 24, 2009. Mr. Simmons has requested that I respond to the NOA.

The purpose of this letter is to advise you, as Director of the Western Region, that HECO is addressing the issues identified in the NOA. HECO takes pride in its pipeline system and strives for continued improvement. The Company acknowledges that continued improvements and enhancements to the Integrity Management Program are essential to the success of the program. To that end, HECO is responding to each of the three items identified in the NOA.

NOA No. 1: "The HECO procedures do not ensure the IMP reviewers and evaluators are qualified. The procedures currently require the documentation of their IMP team members; however, the procedures do not specify the level of qualifications the IMP reviewers must have to adequately review and analyze the assessment results."

HECO Response to NOA No. 1: HECO has modified the IMP text to better address the requirements of 49 C.F.R. §195.452. The IMP Manual now identifies qualifications that IMP reviewers must have to adequately review and analyze the assessment results. The IMP manual is being revised to include the following text:

> Regarding the level of qualification for IMP reviewers, only qualified individuals shall review the integrity assessment results, analyze information generated during integrity assessments, and define the criteria used during the interpretation of inspection results. HECO's Compliance Coordinator and IMP Administrator are considered qualified per the minimum qualification requirements, as written in HECO's Compliance Organization & Integration Document, Iwilei Pipeline. Any other HECO personnel considered qualified to review assessment data must have the same qualifications. (The qualifications for qualified individuals set forth in the Compliance Organization & Integration Document are reproduced in Exhibit A.) It is important to note that HECO personnel do not review raw assessment data, which is reviewed by third-party reviewers. Qualifications for third-party reviewers may come from industry guidance and standards, and/or professional certifications associated with the analysis of ILI results, pressure tests, direct assessment, or other technologies. To review the refined assessment data developed by third-party reviewers based on the raw assessment data, however, HECO employees must maintain their qualifications by attending in-line inspection and/or data review training whenever feasible.
>
> Anomaly documentation will be completed either by qualified HECO personnel who have been qualified under HECO's OQ program, or by a third-party who is qualified pursuant to industry standards and/or professional certifications. HECO must insure that ILI vendors are qualified under ANSI/ASNT-ILI PQ 2005, In-Line Inspection Personnel Qualification and Certification Standard (approved May 2, 2005). Examples of other industry documents include API 1163, In-Line Inspection Systems Qualification Standard, and NACE Standard RP0102-2002, In-Line Inspection of Pipelines. HECO field personnel responsible for locating anomalies shall be qualified under HECO's OQ program. Contractors responsible for locating anomalies shall be qualified under an approved contractor-specific OQ program.

NOA No. 2: "The HECO procedures are inadequate for considering the risks associated with their pipeline facility beyond just line pipe. The facility risk needs to define how equipment such as pumps, valves, and gaskets is addressed via the risk analysis and P&MM processes."

HECO Response to NOA No. 2: HECO understands that this issue deals primarily with HECO's Facility Risk Assessment (FRA) and Facility Risk Model (FRM). Therefore, HECO has revised its FRA to strengthen the incorporation of API 653 (Tank Inspection, Repair, Alteration, and Reconstruction Standards) into the assessment and evaluation process. This addition will enhance the procedures for dealing with risks beyond the pipeline. The risk drivers of HECO's FRA now differentiate tank corrosion from pipeline corrosion, and tank design, material and structure are now considered in the risk driver evaluation. Lastly, risk drivers for tank design, material, structure and corrosion have been incorporated into HECO's facility risk model. HECO's revised FRA and P&MM are included in Exhibit B. Additions to HECO's FRM for tank design, material and structure, and Tank Corrosion are included in Exhibit C.

NOA No. 3: "The HECO procedures are inadequate for defining and ranking Preventive and Mitigative Measures (P&MM) of their facility. This is important to ensure future P&MM decisions are made in a consistent and risk based manner."

HECO Response to NOA No. 3: HECO has revised its IMP Manual to better communicate the procedures for defining and ranking Preventive and Mitigative Measures (P&MMs) of its facility. While HECO's IMP manual already clearly communicates HECO's IM process for its line pipe, the new revisions improve the communication regarding the IM process for its facilities. The revised text is included in Exhibit D.

We trust that the actions and revisions summarized in the responses above resolves each of the items addressed in the NOA. HECO looks forward to continuing to improve our Iwilei Pipeline System. Please do not hesitate to contact me or Mr. Cyril Ontai with any comments or questions.

Sincerely,

Floyd Shiroma
Director, Fuels Infrastructure Division
Iwilei Pipeline Compliance Management Group
Power Supply Services Department
Hawaiian Electric Company, Inc.

cc: Thomas C. Simmons

Exhibit A

3. Minimum Qualification Requirements

3.1 Minimum Qualification Requirements

HECO has formally defined the qualification requirements for the following individuals involved in the Compliance:

As a minimum, the *Compliance Coordinator* must have:

- Formal minimal education (high school graduate or equivalent), and 15 years of work experience applicable to power plant/pipeline operations and maintenance, or
- Formal minimal education (Associate Degree), and 7 years of work experience applicable to power plant/pipeline operations and maintenance, or
- Formal minimal education (Bachelors Degree), and 3 years of work experience applicable to power plant/pipeline operations and maintenance, or
- Demonstrated knowledge of 49 CFR 195 – Transportation of Hazardous Liquids by Pipeline
- Comprehensive knowledge and understanding of HECO's Compliance Program, its philosophy, processes, procedures, implementation deadlines, assigned responsibilities, communication requirements, etc.

As a minimum, the *Compliance Program Administrators* must have:

- Formal minimal education (high school graduate or equivalent)
- Five years of work experience applicable to power plant/pipeline operations and maintenance, or equivalent combination of education and experience
- Demonstrated knowledge of 49 CFR 195 – Transportation of Hazardous Liquids by Pipeline
- Comprehensive knowledge and understanding of HECO's Compliance Program, its philosophy, processes, procedures, implementation deadlines, assigned responsibilities, communication requirements, etc.

As a minimum, the *Power Supply Engineers* must have:

- 4-year degree in engineering or related discipline plus 2 or more years of work experience applicable to power plant/pipeline operations and maintenance
- Demonstrated knowledge of 49 CFR 195 – Transportation of Hazardous Liquids by Pipeline
- Demonstrated knowledge of the area of pipeline work he or she is supporting with appropriate certifications.
- General knowledge and understanding of HECO's Compliance program, its philosophy, applicable processes and procedures.

As a minimum, the HPP *Maintenance Supervisor & Operations Senior Supervisors* must have:

Exhibit B

Integrity Management Program

2008 Facility Risk Assessment and Preventive and Mitigative Measures Evaluation

Honolulu Power Plant and Iwilei Fuel Storage Facility

Hawaiian Electric Company, Inc.
Giving you the power

June 6, 2008

Rev 1, 3/19/2009

Prepared by:

Kendrick Consulting LLC
417 Gettysburg St Ste 200
Pittsburgh, PA 15206
412-362-9818

Risk Assessment and Preventive and Mitigative Measures Evaluation Report

MEETING INFO

Location: Honolulu Power Plant, 170 Ala Moana Blvd, Honolulu, Hawaii, 96813
Date: 05/14/2008
Attendees:

Name:	***Title***	***Phone***	***Email***
Cyril Ontai	Staff Engineer	808.543.4396	cyril.ontai@heco.com
Colin Higa	Operations Supervisor	808.543.4540	colin.higa@heco.com
Todd Kushner	Consultant/KCLLC	412.362.9818	tkushner@kendrickllc.com
Andrew Kendrick	Consultant/KCLLC	412-362.9818	akendrick@kendrickllc.com

Meeting Agenda/Topics:

1. Overview of Integrity Management Regulations and their applicability to Hawaiian Electric Company, Inc. (HECO) facilities.
2. HECO Integrity Management Program (IMP) Overview.
3. Worst-Case Discharge (WCD), spill flow, and High Consequence Area (HCA) overview (using GIS).
4. Facility operations overview.
5. Facility walk-around and identification of jurisdictional components.
6. Field assessment of facilities (atmospheric corrosion, security, safety systems, etc.).
7. Complete Risk Assessment model spreadsheet (using Subject Matter Expert (SME) input, Facility Spill Response Plan, tank data sheets, and other relevant records).
8. Review of Risk Assessment model results for accuracy/validation.
9. Discuss major threat drivers and identify additional Preventive & Mitigative Measures (P&MM) activities.
10. Assign P&MM activities as "action items" for implementation or further evaluation.

HECO FACILITY OPERATIONS OVERVIEW

HECO operates two facilities within the City and County of Honolulu, on the island of Oahu, Hawaii. The following sections describe the jurisdictional components and operations at both the Honolulu Power Plant (HPP) and Iwilei Fuel Storage Facility (IFSF). Table 1 provides general information about each of the facilities. Attachments I and II provide facility schematics for HPP and IFSF, respectively. Pictures of HPP and IFSF were taken during the facility walk through and are stored on the HECO servers.

Table 1 – HECO Facility Information	
Facility Name and Address: Honolulu Power Plant 170 Ala Moana Boulevard Honolulu, Hawaii 96813 **Facility Telephone Number:** (808) 543-4541 **Owner/Operator of the Facility:** Hawaiian Electric Company, Inc. P.O. Box 2750 Honolulu, Hawaii 96840-0001 (808) 543-5673 **Latitude and Longitude:** 21° 18' 33" North, 157° 51' 5" West **Dun & Bradstreet Number:** 006926927 **NAICS:** 221112 **Facility Distance to Navigable Water:** 0 - ¼-mile	**Facility Name and Address:** Iwilei Fuel Storage Facility 855 Nimitz Highway Honolulu, Hawaii 96813 **Facility Telephone Number:** (808) 543-4595 **Owner/Operator of the Facility:** Hawaiian Electric Company, Inc. P.O. Box 2750 Honolulu, Hawaii 96840-0001 (808) 543-5673 **Latitude and Longitude:** 21° 19' 2" North, 157° 52' 27" West **Dun & Bradstreet Number:** 006926927 **NAICS:** 424710 **Facility Distance to Navigable Water:** 0 - ¼-mile

Honolulu Power Plant

HPP is a 115 megawatt power plant that stores bulk oil as fuel for two generating units (Units 8 and 9). The facility occupies a 3.4 acre site on the south side of the island of Oahu, on the eastern side of Honolulu. The facility is bounded by Nimitz Highway to the east, Bishop Street to the north, and Richards Street to the south. Ala Moana Boulevard forms the western boundary, beyond which is Honolulu Harbor. The facility is not located within a wellhead protection area. A facility schematic drawing of HPP is provided as Attachment I.

The facility is fully fenced and manned 24 hrs a day, 7 days a week. Facility security measures are in place to prevent unauthorized access into the terminal. The DOT- jurisdictional components include:

- 1 Aboveground Breakout Tank (No. 7)
- 11 Valves
- 1 Pump
- 1 Fuel Oil Heater
- 1 Coriolis Meter
- 1 Diesel Flow Meter
- PIG Receiver

- Facility Piping

Products stored at HPP include Low Sulfur Fuel Oil (LSFO), diesel fuel, and lube oils. The associated Iwilei pipeline is used to transport LSFO and diesel oil from IFSF to HPP. Diesel oil, used as displacement oil, is pumped through the pipeline to flush LSFO out after transfers to prevent solidification of LSFO in the pipeline. Diesel oil is periodically received in bulk from tank trucks and stored in DOT-jurisdictional Tank No. 7 located within a bermed area. Deliveries are unloaded directly from the tank trucks into the 1000 bbl tank. Storm drains in the vicinity of the storage tank are temporarily covered during diesel oil transfers from truck to tank. Although unusual, the facility is also equipped to receive deliveries of LSFO.

HPP is normally staffed by at least one Utility Operator and Shift Supervisor 24 hours a day 7 days a week. When transferring fuel through the Iwilei pipeline, an additional Utility Operator mans the tank farm and assists in monitoring the pipeline operations. The total oil storage capacity at HPP is 30,375 barrels (bbls). LSFO is stored on-site in two 14,000 bbl non-jurisdictional tanks. Information on the jurisdictional aboveground storage tank (Tank No. 7) at HPP is provided in Table 2. Tank No. 7 is constructed of steel in compliance with contemporary API specification and industry standards. Impervious masonry and concrete dikes provide secondary containment around the two 14,000 bbls LSFO tanks. The 1000 bbl diesel oil tank is contained by masonry and concrete walls. Table 2 presents specific tank and secondary containment information.

Drainage from diked LSFO storage areas is restrained by drain valves which are locked in the closed position. When sufficient rainwater has accumulated within the diked area, the water is visually inspected for any film, sheen or discoloration due to the presence of oil. If detected, oil is removed prior to discharge of the rainwater. Accumulated rainwater from diked storage areas is not drained directly to navigable waters. Rather, the drain valves are then opened and the rainwater is allowed to drain into the wastewater treatment system under responsible supervision. Valves are resealed and locked following drainage and all records are maintained of secondary containment draining.

Rainwater from the diked diesel storage area is allowed to evaporate. The diked diesel storage area is not equipped with a drain valve. The wastewater and storm-water systems are routinely operated or maintained to prevent, detect, contain, and remove oil prior to discharge.

Table 2 - DOT-Jurisdictional Aboveground Storage Tanks – Honolulu Power Plant

Tank	High/ Low Level Alarms	Product	Maximum Capacity (bbls)(2)	Type	Year	Average. Daily Quantity (bbls)	Secondary Containment Capacity (bbls)
Tank 7	Y	Diesel	1040	Fixed	1953	450	2,300
	Maximum Oil Storage Capacity (bbls):		**1040**	**Total Secondary Containment Capacity (bbls):**			**2,300**

(1) A = Aboveground Tank (2) Quantities are maximum fill level

Iwilei Fuel Storage Facility
IFSF is utilized as a tank farm that stores oil for use at HPP. The facility is located approximately 1.2 miles west of HPP and occupies approximately 85,918 square feet. The facility is bordered to the west by a refrigerated container storage yard and used auto parts warehouse, to the south and east by the entrance road to Piers 31 through 33 and to the north by the Nimitz Highway. The facility began receiving LSFO via tanker trucks in January 2005. Prior to that, the LSFO was received at IFSF from Barber's Point via a Chevron pipeline. Fuel receipts occur Monday through Friday at various intervals during a 24 hour period. . Each truck delivers approximately 131 bbls, and there are anywhere from 5-15 deliveries per day. All deliveries are pumped into the DOT-jurisdictional Tank No. 2. A facility schematic of IFSF is provided as Attachment II.

The facility is fully fenced and manned 24 hrs a day, 5 days a week. Facility security measures are in place to prevent unauthorized access into the terminal. The DOT- jurisdictional components include:

- 3 Aboveground Breakout Tanks (Nos. 2, 3, & 4)
- 31 Valves (1 MOV)
- 2 Pressure Relief Valves
- 3 Pumps
- 1 Basket Strainer
- 1 Coriolis Flow Meter
- PIG Launcher
- Facility Piping

The products stored at IFSF include LSFO and diesel fuel. LSFO is received via tanker trucks and pumped via the Iwilei pipeline to HPP. Diesel fuel is received and shipped via pipeline to/from HPP. The total oil storage capacity at IFSF is 81,300 bbls. At IFSF, fuel oil is transferred an average of two days per week for up to twelve hours at approximately 500-600 gpm each time. The facility is fully manned during pipeline transfers, and routinely inspected for leaks, spills, and security. Pumps, valves, flanges, and other fittings are routinely maintained and inspected for leaks and drips, and any equipment failures.

The facility includes 3 DOT-jurisdictional tanks inside of a secondary containment area. LSFO is stored in one 80,400 -bbl tank (Tank No. 2) and is transferred via the Iwilei pipeline to HPP. Diesel oil is stored in two 450 bbl tanks (Tank Nos. 3 & 4) and is used to displace LSFO from the pipeline after each LSFO transfer. Tank No. 2 is electrically heated and shares containment with the two diesel tanks (Nos. 3 & 4). During line displacement activities the two diesel tanks are interconnected and operated as a single tank. Otherwise, the tanks are isolated from each other. The LSFO tank (Tank No. 2) at IFSF was installed in 1941 and was inspected and fitted with a double bottom (El Segundo bottom) in 1997 after the shell was found to be leaking and significant corrosion was discovered where the asphalt touched. The diesel tanks (Tank Nos. 3 & 4) were inspected using appropriate provisions of API 653 in 1996. Both tanks received minor bottom repairs following the inspection. External surfaces are painted to minimize atmospheric corrosion. With the exception of the 1997 leak described above, there have been no tank failures at the facility. Further information on the DOT-jurisdictional tanks at IFSF is provided in Table 3. The pump station for LSFO and diesel oil transfers is located inside the containment area.

IFSF is provided with a secondary containment berm around the oil storage tanks to contain oil and prevent discharged oil from reaching navigable waters. The secondary containment berms are designed to provide enough capacity for the contents of the largest tank plus sufficient freeboard to allow for precipitation. Table 3 presents specific tank and secondary containment information. The existing containment area floor for Tank No. 2 is unpaved. Due to the physical properties of LSFO, the earthen floor is expected to be sufficiently impervious. Tank Nos. 3 & 4 were provided with a separate containment system in 2001. This system includes a concrete wall and HDPE liner to provide an impermeable layer.

The drainage from the diesel berm storage area (Tank Nos. 3 & 4) is restrained by drain valves that are locked in the closed position. When sufficient rainwater has accumulated within the bermed area that necessitates drainage, the water is visually inspected for any film, sheen, or discoloration due to the presence of oil. If detected, oil is removed prior to discharge of the rainwater. Then the water is either drained or pumped out. Valves are resealed and locked following drainage and records are maintained of secondary containment draining/pumping. There are no valves to drain rainwater from the LSFO Tank 2 diked area. Rainwater evaporates and percolates into the unpaved containment area floor.

Table 3 - DOT- Jurisdictional Aboveground Storage Tanks - Iwilei Fuel Storage Facility

Tank	High/ Low Level Alarms	Product	Maximum Capacity (bbls)(2)	Type	Year	Average. Daily Quantity (bbls)	Secondary Containment Capacity (bbls)
Tank 2	N	LSFO	80,400	Fixed	1941	40,000	95,400
Tank 3	N	Diesel	450	Fixed	1969	30	544
Tank 4	N	Diesel	450	Fixed	1969	30	544
	Maximum Oil Storage Capacity (bbls):		81,300	Total Secondary Containment Capacity (bbls):			**95,400+**

(1) A = Aboveground Tank (2) Quantities are maximum fill level

WORST-CASE DISCHARGE AND HCA IMPACT

Honolulu Power Plant

HPP is a multiple tank facility. All tanks are provided with adequate secondary containment that includes extra volume. There are no tanks which are permanently manifold together. The capacity of the largest aboveground storage tank (Tank Nos. 5 & 6) is 14,000 bbls, therefore the WCD, calculated by the FSRP, is a planning volume of 14,000 bbls of LSFO (Group 3 persistent oil). The failure of the concrete secondary containment is unlikely and secondary containment drain valves are sealed to prevent unauthorized or accidental discharge.

The breach of the secondary containment was assumed under a catastrophic scenario when determining the impact on HCAs. The facility can affect more than one HCA, as defined by National Pipeline Mapping System (NPMS).

Direct-affect HCAs:

- High Populated Area (HPA), Other Populated Area (OPA), and Ecological USA (ECO)

Indirect-affect HCAs:

- Commercially Navigable Waterway (CNW)

The worst-case discharge scenarios, tank volumes, and potential HCA impacts were reviewed and validated by SMEs during the Risk Assessment and P&MM Evaluation Meeting.

Iwilei Fuel Storage Facility

IFSF is a multiple tank facility. All tanks are provided with adequate secondary containment that includes extra volume. There are no tanks which are permanently manifold together. The capacity of the largest aboveground storage tank is 76,200 bbls, therefore the WCD, calculated by the FSRP, is a planning volume of 76,200 bbls of LSFO (Group 3 persistent oil). The failure of secondary containment is unlikely, and no secondary containment drain valves are located within the containment area.

The breach of the secondary containment is assumed under catastrophic scenario in determining the impact on HCAs. The facility can affect more than one HCA, as defined by NPMS.

Direct-affect HCAs:

- HPA, OPA, and ECO

Indirect-affect HCAs:

- CNW

The worst-case discharge scenarios, tank volumes, and potential HCA impacts were reviewed and validated by SMEs during the Risk Assessment and P&MM Evaluation Meeting.

Spill Detection

Honolulu Power Plant

HECO personnel are on duty 24 hours a day, seven days a week. Daily visual inspections are performed by all workers. Operators make hourly rounds 24 hours a day. A discharge from facility storage tanks or piping would be noted during visual inspections or when a pressure loss is noted in gauges and in differential pressure between the pump and endpoint gauges. Any discharges detected would initiate the mitigation procedures described in the FSRP.

There are no automated discharge detection systems at HPP. However, Tank No. 7 has high/low level alarms as indicated on Table 2.

Iwilei Fuel Storage Facility

At a minimum,HECO personnel are on duty 24 hours a day, five days a week, and the facility is equipped with security cameras that are monitored 24 hours a day, seven days a week. The facility is manned at all times during pipeline transfer operations and visually maintained and inspected periodically for spills, leaks, and security. Any discharges noted initiate the mitigation procedures described in the FSRP. Also, Tank No. 2 is manually gauged at midnight if tanker truck deliveries are received during the day.

RISK ASSESSMENT

Risk Assessment Model

The Risk Assessment Model used during the evaluation was designed by HECO SME's and Kendrick Consulting LLC (KCLLC) and is described in the "Integrity Management Program - Iwilei Pipeline". API Standard 1160, "Managing System Integrity for Hazardous Liquid Pipelines", and API Standard 653, "Tank Inspection, Repair, Alteration, and Reconstruction", were utilized to determine the applicable data to collect for evaluation of facility risk.

The model provides an organized outline for HECO SMEs to conduct the facility risk assessment. During the risk assessment meeting, the model identified individual likelihood and consequence risk variables associated with a particular component of the facility (i.e. breakout tanks, DOT-jurisdictional valves, site security and complexity, system operations, emergency response, etc.).

SMEs populated the Risk Model spreadsheet by selecting the most appropriate response following discussions on each topic/risk variable. The results are documented in the Risk Model spreadsheet, along with any relevant information and comments.

Risk Assessment Results

HECO SMEs reviewed and validated the results to assure that they are meaningful and represent true facility risk at HPP and IFSF. Refer to the Risk Assessment spreadsheet for detailed information on all risk variables and topics evaluated. The following provides a summary of the risk drivers found at HPP and IFSF.

Risk Drivers

As indicated by the risk assessment results, HPP and IFSF are low-risk facilities. The following are descriptions of each of the topics discussed and the effect on the overall facility risk.

- *Design & Materials*: All equipment at both HPP and IFSF is contained and in satisfactory condition. The equipment is maintained and visual inspections occur on a regular basis by the operators. Tank bottoms were recently replaced and repaired at HPP and facility piping is schedule 40. This area is low risk, however data collection on the specifications of each individual pump, valve, etc. would improve documentation and review. A potential for pump seal failure exists, a P&MM will be further evaluated to determine if additional measures are necessary. The DOT-jurisdictional tanks are to be assessed to determine whether tank grounding straps are in place to prevent the possibility of tank fires due to lightning. Diesel Tanks 3 & 4 could be evaluated to determine the need of tank gauging or other methods of monitoring. These two tanks were determined by the SMEs to have the greatest risk of overfill potential due to the operators having to switch the valve lineup in order to receive the displacement oil at IFSF. Tank inspection deadlines will be reviewed and appropriate schedules are to be followed in accordance with 49 CFR 195.432.
- *System Operations: Operations at both IFSF and HPP are simple and no reportable failures have occurred in the last 10 years. Redundant safety-devices are in place at IFSF and tank gauging is monitored on each of the DOT-jurisdictional tanks.* Coriolis meters are in place to monitor pressure and flow between IFSF and HPP, however HECO will evaluate providing the readings of both meters at each of the facilities. Currently, HECO operators have to communicate the pressure and flow readings back and forth between facilities to evaluate the transfer operations. Recently, HECO improved the communicate process between IFSF and HPP by provided a means of secondary communication for the operators to use during transfer. Continued improvement of the normal and abnormal operations will continue and training will provide continued prevention of the possibility of operator error and potential overpressure events.
- *Pipe Corrosion: Corrosion is a risk driver at both facilities. Regarding piping, under insulation corrosion (UIC) needs to be assessed and a process needs to be established to evaluate/mitigate the areas under insulation at HPP and IFSF. HECO could evaluate the need to establish a Predictive and Preventative Maintenance Program (PPM) for the facilities to evaluate facility piping by UT and other aspects of operations such as pump maintenance etc.*
- *Tank Corrosion, API Standard 653 is utilized to evaluate corrosion of HECO's jurisdictional breakout tanks. The risk model includes eight risk drivers related to corrosion of the external tank surfaces and components, and three risk drivers related to corrosion of the internal tank surfaces and components. HECO will continue to perform tank inspections in accordance with API 653, follow all recommendations of inspectors, review and evaluate all data, and address all issues.*

- *Tank Design, Material and Structure, API Standard 653 is utilized to evaluate the design parameters and material properties used during reconstruction of HECO's tanks. In addition, API Standard 653 tolerances are utilized to evaluate the tank structural stability. The risk model includes three risk drivers related to each of the three risk attributes of design, material, and structure. HECO will continue to perform tank reconstruction and maintenance in accordance with API 653, follow all recommendations of builders and inspectors, review and evaluate all data, and address all issues.*
- *External Forces: This is not a significant risk driver due to the location of the facilities and equipment.*
- *Leak Impact* is a major risk driver due to HCA types that would possibly be affected by a release and the product characteristics (LSFO and diesel).

HECO SMEs evaluated candidate P&MMs to address the above-mentioned risks.

PREVENTIVE AND MITIGATIVE MEASURES EVALUATION

Regulatory Requirements

Pipeline operators are required by 195.452(i) to take measures to prevent and mitigate the consequences of a pipeline failure that could affect an HCA. This determination must consider all relevant risk factors and, at a minimum, factors listed in 195.452(i)(2). The applicability of each required factor is discussed below:

- *Terrain surrounding the pipeline segment, including drainage systems such as small streams and other smaller waterways that could act as a conduit to the HCA*–in the event of a spill and breach of the secondary containment area, potential drainage pathways were identified that would present a significant risk to HPAs, OPAs, ECO, and CNWs. However, there is a very-low likelihood of this catastrophic event occurring. All potential spills are expected to be contained within facility property at both HPP and IFSF.
- *Elevation profile* – with the flat terrain, there is no significant areas of concern.
- *Characteristics of the product transported* - diesel and LSFO have moderate flammability and contamination hazard.
- *Amount of product that could be released* – based on the FSRP planning volume of the largest tank in both terminals is 79,350 bbls (IFSF Tank No. 2 - LSFO).
- *Possibility of a spillage in a farm field following the drain tile into a waterway* - not applicable.
- *Ditches alongside a roadway the pipeline crosses* – all facility piping is contained within the facility boundary, no roadways are crossed. Risk presented by the Iwilei pipeline will be evaluated during the Iwilei Pipeline Risk Assessment.
- *Physical support of the pipeline segment such as by a cable suspension bridge* – aboveground segments are supported in HPP and IFSF, the piping and supports are kept in good condition.
- *Exposure of the pipeline to operating pressure exceeding established maximum operating pressure* - overpressure is unlikely, flow and pressure are monitored, PRVs are installed at IFSF.

Current Measures to Reduce Risk

HECO corporate management and HPP and IFSF personnel are committed to conducting safe operations and protecting public and environment from hazardous liquids spills. The facilities are operated and maintained in accordance with all applicable federal and state regulations, current industry standards, and company best-practices.

During the Risk Assessment meeting, HECO SMEs identified the following measures already in place at HECO facilities:

- Facility Security Plan
- Spill Prevention Control and Countermeasure (SPCC) Plan
- Facility Spill Response Plan (FSRP), Emergency Response Action Plan (ERAP), Response Management Plan
- Annual table top drills
- Maintenance and inspection on facility equipment
- Drug testing program
- Public Awareness Program
- Daily tank visual inspections
- External surfaces of components (i.e. piping and tanks) are painted to minimize atmospheric corrosion.
- Tank Nos. 3 & 4 were provided with a separate containment system in 2001. This system includes a concrete wall and HDPE liner to provide an impermeable layer.
- The LSFO tank (Tank No. 2) at IFSF was installed in 1941 and was inspected and fitted with a double bottom (El Segundo bottom) in 1997.
- Each jurisdictional breakout tank is operated, maintained, reconstructed, and inspected in compliance with API Standard 653.
- Contract in place with Oil Spill Recovery Organizations (both Clean Island Council and Marine Spill Response Center (MSCR)), last emergency drill conducted in 2007.

Recommended Additional Measures

Based on evaluation of current P&MMs and risk assessment results, the additional measures were recommended for implementation or further evaluation and assigned to the responsible individuals. These measures are summarized in Table 4. The status of these recommended measures must be tracked and updated. All selected P&MMs must be implemented. If any candidate P&MMs are not selected for implementation, justification must be documented.

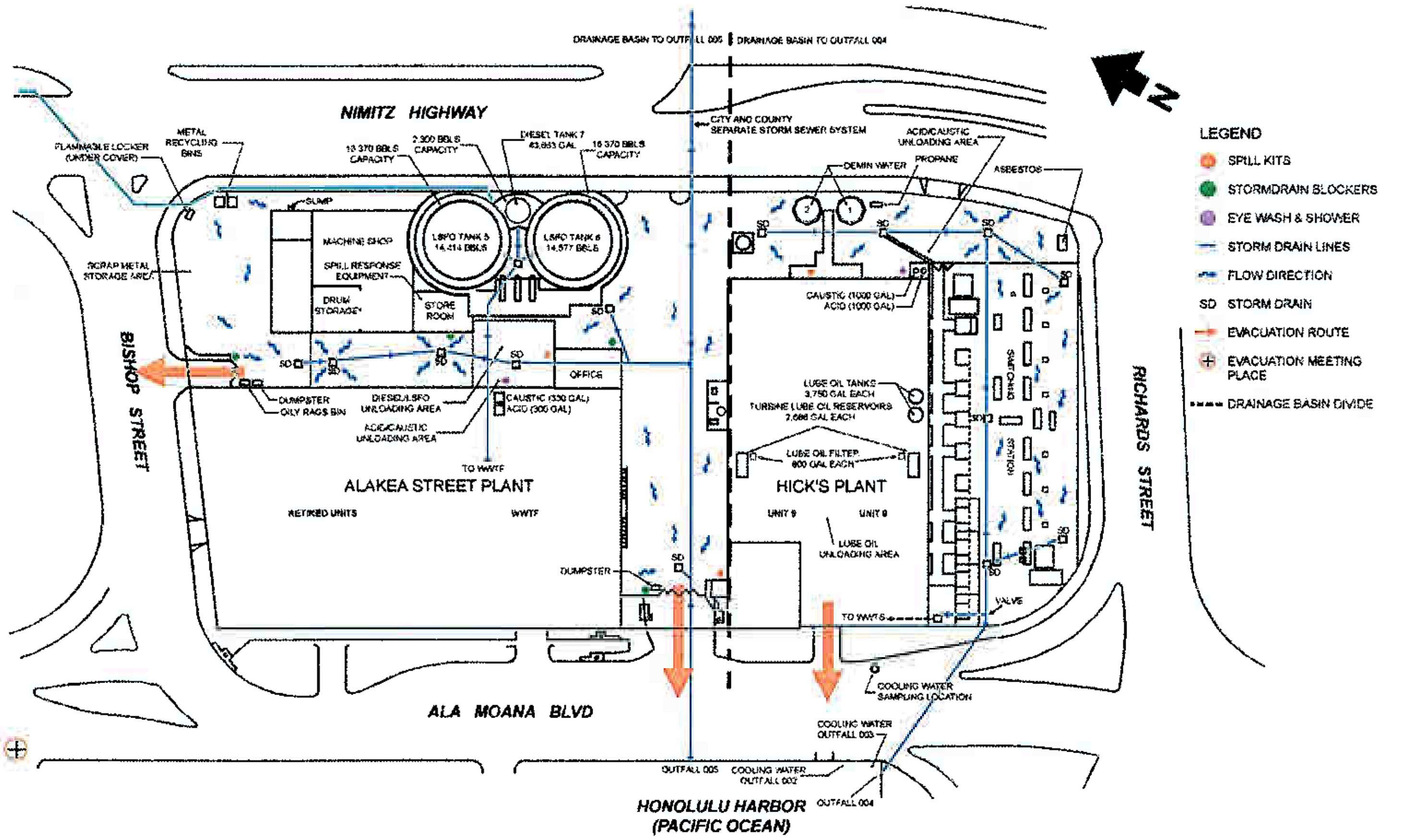
Table 4 – Additional P&MMs Recommended for Evaluation or Implementation

Facility threat	Recommended measure	Assigned to	Additional evaluation or approvals needed	Target Date	Approved activities and implementation date (rationale if not implemented)*
Pump seal failure	Establish/Coordinate a Preventive Maintenance Program to maintain/inspect pump seals.	TBD	YES	TBD	
Tank fire due lightning	Evaluate whether the tanks at IFSF and HPP have grounding straps already in place, if they do not, evaluate the need to install grounding straps.	TBD	No	TBD	
Pressure relief valve incorrectly calibrated	Pressure relief valves are replaced annually. To confirm calibration, the removed valves could be pressure tested to determine if settings are correct.	Not to be implemented	No	Not to be implemented	HECO requires and retains the certifications from the pressure relief valve vendors which certifies the valves to be in correct working order.
Communication between operators at IFSF and HPP	Add a form of redundant communication for the operators to utilize if the land-lines are down.	Higa	No	May 1, 2008	Completed – Operators use cellular phones for routine communication and redundant communication is provided by the land line.
Adequacy of programs	Continual review and updates of all procedures and programs to ensure current operations and procedures are used for training.	Ontai	No	Continuous	Hired KCLLC to review and audit IMP, O&M, PA, and OQ plans.
Under Insulation Corrosion	Evaluate/Mitigate the areas under insulation at HPP per 195.583.	C. Ontai	Yes	completed 12/2008	

Facility threat	Recommended measure	Assigned to	Additional evaluation or approvals needed	Target Date	Approved activities and implementation date (rationale if not implemented)*
Piping corrosion control	Incorporate into the preventive maintenance program, the need for UT evaluation of facility piping (piping that is not evaluated by the ILI tools).	C. Ontai	Yes	completed 12/2008	
Tank corrosion control	Perform appropriate inspections. Ensure recommendations from previous 653 Inspections were and are completed and appropriate schedules are followed in accordance with 195.432.	D. Sato	Yes	TBD	
Tank monitoring	Tanks 3 & 4 were identified to have the greatest potential for tank overflow. Determine whether additional evaluation/monitoring/gauging needs to be conducted on these tanks.	TBD	Yes	TBD	
Component inventory/ data collection and retention	Collect data currently missing in the facility risk assessment for each individual component on the line. Improve documentation retention.	Ontai	No	TBD	

** all supporting documentation, including engineering evaluations, MOC documentation, or rationale for not selecting the measure and proposed alternatives must be documented and attached to this report on maintained at the Facility and be readily available for inspection*

ATTACHMENT I – FACILITY DIAGRAM – HONOLULU POWER PLANT



NOTES:
1. GROUND COVER IS A C PAVEMENT EXCEPT THE AREA BETWEEN THE OFFICE AND THE DRUM STORAGE, WHICH IS CONCRETE.
2. OIL FILLED ELECTRICAL EQUIPMENT (TRANSFORMERS AND CIRCUIT BREAKERS) ARE LOACTED IN THE SWITCHING STATION.

ATTACHMENT II – FACILITY DIAGRAM - IWILEI FUEL STORAGE FACILITY

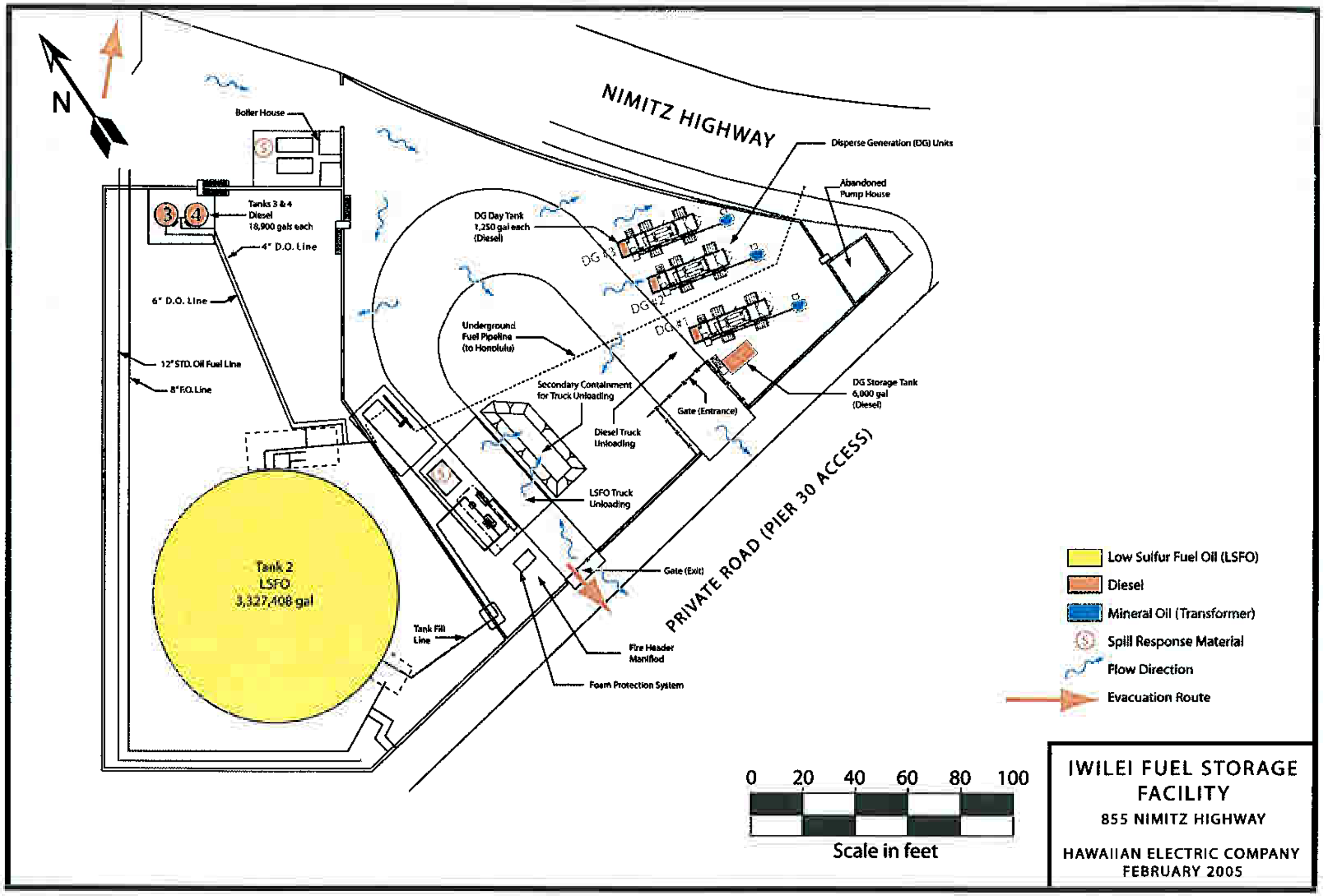


Exhibit C

HECO Facility Risk Model Additions

A1 | Name >>>

	A	B	C	D	E	
1	Name >>>	Diesel Oil Tank #[illegible]	Fuel Oil Tank #2	Diesel Oil Tank #3	Diesel Oil Tank #4	
2	Location >>>	[illegible]	IFSF	IFSF	IFSF	
27	Tank Design, Material and Structure					
28	Tank design incorporates seismic stability	Select:	Select:	Select:	Select:	Yes, No, c
29	Roof design meets current as-built standards	Select:	Select:	Select:	Select:	Yes, No, c
30	Bottom design meets current as-bilt standards	Select:	Select:	Select:	Select:	Yes, No, c
31	Bottom plate thickness and material per API 650	Select:	Select:	Select:	Select:	Yes, No, c
32	Suitable cushion material between bottoms	Select:	Select:	Select:	Select:	Yes, No, c
33	Tank seals in good condition	Select:	Select:	Select:	Select:	Yes, No, c
34	Plumbness and roundness within tolerance	Select:	Select:	Select:	Select:	Yes, No, c
35	Horizontal foundation pad	Select:	Select:	Select:	Select:	Yes, No, c
36	Good foundation support without voids	Select:	Select:	Select:	Select:	Yes, No, c
37						
38	Tank Corrosion					
39	External shell/seam corrosion	Select:	Select:	Select:	Select:	Yes, No, c
40	External roof corrosion, grooving, or pitting	Select:	Select:	Select:	Select:	Yes, No, c
41	External coating/paint condition	Select:	Select:	Select:	Select:	Yes, No, c
42	Handrail and support corrosion	Select:	Select:	Select:	Select:	Yes, No, c
43	Roof deck plate corrosion, holes, or pitting	Select:	Select:	Select:	Select:	Yes, No, c
44	Sample hatch cover corrosion	Select:	Select:	Select:	Select:	Yes, No, c
45	Roof scaffold support wear or corrosion	Select:	Select:	Select:	Select:	Yes, No, c
46	Auto Gauge Corrosion	Select:	Select:	Select:	Select:	Yes, No, c
47	Out-of-service internal floor corrosion	Select:	Select:	Select:	Select:	Yes, No, c
48	Out-of-service internal roof corrosion	Select:	Select:	Select:	Select:	Yes, No, c
49	Out-of-service internal shell corrosion	Select:	Select:	Select:	Select:	Yes, No, c
50						
51	Operations & Safety					

Summary | Tanks | Pumps | Valves | Safety Devices | Piping | Other | Site | P&MMs

Exhibit D

1. 3 Overview of Facility and Pipeline System

This manual covers HECO's Iwilei pipeline that supplies fuel oil to HECO's Honolulu Power Plant (HPP), located at 170 Ala Moana Boulevard in Honolulu, Hawaii. Low Sulfur Fuel Oil (LSFO), used for boiler operation, and diesel oil, used for pipeline displacement, are transported through the 6-inch Iwilei pipeline from the Iwilei Fuel Storage Facility (IFSF) to the HPP.

1.3.1 Facilities

The IFSF has a total LSFO storage capacity of 79,224 bbls (Tank No. 2) and HPP has a total LSFO storage capacity of 29,327 bbls (Tank Nos. 5 & 6). The IFSF receives product delivered by trucks that are loaded at Barber's Point Tank Farm (Chevron Refinery).

While the integrity management process for facilities and pipeline are similar, facility risk is detailed in section 3.5.

1.3.2 Pipeline

The entire pipeline lies in the State-owned Right-of-Way (ROW) within the City and County of Honolulu, on the island of Oahu, Hawaii. The line was originally constructed in 1969 of schedule 40, low frequency, electric resistance welded (LF-ERW) pipe. The pipeline is coated for the entire length and has two cathodic protection rectifier stations to inhibit corrosion. Originally 20 subsurface concrete inspection boxes (vaults), housed with accordion-type expansion joints were installed to allow for thermal expansion and visual inspection of the pipeline. Currently, 8 vaults that contain 14 accordion-type expansion joints remain on the line; others have been replaced with straight line pipe. Manual block valves are located within the secured facilities at each end of the line. An in-line, manual block valve is located just west of the Nuuanu Stream crossing in vault box #11. The pipeline depth of cover varies across its length, averaging approximately 2 to 4 feet below grade. An overall map of the pipeline can be found in Appendix A.

While the integrity management process for facilities and pipeline are similar, sections 4.0 and 5.0, describe processes that deal specifically with pipeline IMP.

1.3.3 Operations

Product transfer normally occurs twice a week requiring approximately 8-12 hours to complete. The pumping rate is between 500 and 600 gpm. The LSFO is maintained at approximately 175°F to facilitate pumping of the heavy product. Upon completion of transfer, the remaining LSFO in the pipeline is displaced into the HPP fuel oil tank (Tank No. 7) with similarly heated diesel oil from the IFSF displacement oil tanks (Tank Nos. 3 & 4). The pipeline's Normal Operating Pressure (NOP) is approximately 175-210 psi, with a Maximum Operating Pressure (MOP) of 250 psi. Because the MOP is less than 20% of the specified minimum yield strength (SMYS), the pipeline is considered a low-pressure pipeline. HECO recently completed the design and implementation of an improved inventory control monitoring system for use during product transfer. The new system includes coriolis flow meters, pressure transducers, recorders, and totalizers to create a continuous pressure recording and fuel flow measurement system.

The Iwilei pipeline is described in further detail in the HECO's Operations & Maintenance Compliance Manual for Iwilei Pipeline (O&M Manual). The most current version of the O&M manual is maintained on HECO's intranet at: S:\PowerSupplySharedFolders\Iwilei Pipeline\Compliance\OM_Program Compliance Manual .

1.5 IMP Approach

To comply with the Rule, HECO has developed the initial IMP framework document and the Baseline Assessment Plan (BAP) on February 18, 2003. The original HECO IMP framework was developed to comply with the Rule, and was based on the concepts of API Standard 1160, "Managing System Integrity for Hazardous Liquid Pipelines".
This current version of the IMP, called "Integrity Management Program Manual" (referred to as "IMP Manual"), is an enhanced, comprehensive, and fully developed program. HECO's current IMP includes complete, well-documented, and effectively implemented processes for all IMP elements.

Section 3 of this document, Initial Risk Analysis and Relative Risk Model, outlines HECO's process for performing pipeline and facility risk analysis, including details of the methods used to determine pipeline and facility risk factors and the mechanisms for implementing the risk assessment on HECO assets. The facility risk component focuses on how equipment such as pumps, valves, and gaskets are addressed in the risk analysis. Section 6, Risk Management - Prevention and Mitigation, describes the process for identifying, evaluating, and selecting measures to be taken to prevent and/or mitigate consequences of a pipeline or facility failure that could affect an HCA. HECO utilizes their existing Operations and Maintenance (O&M) program for the prevention and mitigation of its facility components. Further, HECO utilizes American Petroleum Industry (API) Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction, for the prevention and mitigation of tank failures.

HECO commits significant resources to proactively manage their pipeline and facilities. The pipeline management program includes routine operations and maintenance (O&M), operator qualification program (OQ), periodic in-line inspections (ILI) and repairs, cathodic protection (CP), third party damage (TPD) prevention, public education and awareness programs, right-of-way inspection/surveillance, and emergency response planning. This IMP manual outlines how HECO will continue to achieve their goal of zero releases
HECO used existing processes and programs already underway as the starting point for its IMP and will continue to improve the program through the adoption of best practices learned from others, enhanced recordkeeping, improved mapping and data management, continuous assessments, and ongoing training.

The following outlines HECO's IM process for both facilities and pipeline:

- Section 2 identifies the segmentation process and includes the facilities and pipeline.
- Section 3 describes the risk analysis for both the facilities and pipeline.
- Sections 4 and 5 discuss IM processes that deal specifically with pipeline. The facility IM process is detailed in the Facility Risk Assessment and Preventive and Mitigative Measures Evaluation Document (provided under separate cover)
- Sections 6 through 9 detail the balance of the IM process for both the facilities and pipeline.

3.0 INITIAL RISK ANALYSIS AND RELATIVE RISK MODEL

3.1 Purpose

This section outlines HECO's process for performing pipeline and facility relative risk analysis, including methods of combining and integrating risk information, risk factors, risk results, implementation of the risk analysis process, and facility risk evaluation. A comprehensive risk assessment process used in determining the need for additional risk reduction measures is described in Section 8, Risk Management – Prevention and Mitigation.

3.2 Components of Risk

Risk is a measure that combines both the likelihood of conditions or events resulting in pipeline or facility failure and the type and magnitude of the resultant consequences. Although complex in application, risk can be expressed as a simple mathematical relationship:

Risk = Likelihood x Consequence

The purpose of the initial risk analysis was to establish the relative risk of identified pipeline segments and prioritize them for Baseline Assessment. As required by the Rule, when scheduling assessments, an operator must consider all risk factors relevant to that pipeline segment.

The Rule requires that the following minimum factors be included (195.452(e)(1)):

1) Results of the previous integrity assessment, defect type and size that the assessment method can detect, and defect growth rate;
2) Pipe size, material, manufacturing information, coating type and condition, and seam type;
3) Leak history, repair history, and cathodic protection history;
4) Product transported;
5) Operating stress level;
6) Existing or projected activities in the area;
7) Local environmental factors that could affect the pipeline (e.g., corrosivity of soil, subsidence, climate);
8) Geo-technical hazards; and
9) Physical support of the segment such as by a cable suspension bridge.

Since HECO operates only one relatively short pipeline that will be assessed as a single assessment segment, there was no need to prioritize the segments for scheduling purposes. Therefore, the risk analysis results were used for identifying significant pipeline threats, selecting appropriate assessment methods, and evaluating the need for additional Preventive and Mitigative Measures (P&MMs).

3.3 Preliminary Risk Analysis

The initial risk analysis required to prepare the BAP was a cursory risk screening utilizing available information. The objective of the initial data gathering, review, integration and analysis process was to obtain and review pertinent information that could help determine the integrity of a pipeline segment, identify and understand the risks associated with its operation, and compare it with other pipeline segments to determine a relative risk. This information was used to conduct the initial risk screening analysis, which established the basis for baseline assessment method selection.

The initial screening analysis was a high-level screening, utilizing information readily available or generally believed to be true about the Iwilei pipeline and surrounding environment. More objective data will be obtained and evaluated after completion of the baseline assessment. More robust risk analyses will be conducted over the course of the IMP Program, utilizing more complete and integrated data sets. The goal is to replace subjective, SME-based information with objective, data-driven information. In addition, HECO will be evaluating sources of uncertainty and focus future data collection efforts on these areas. Integrity management priorities will be established as justified by the outcome of the risk analysis process. SMEs in risk management, pipeline integrity, engineering, operations, etc. necessary will collaborate on the risk analysis.

3.4 Relative Risk Model

A relative risk model was used to evaluate data for each pipeline segment that has the potential for impacting an HCA. This screening tool is designed as a series of questions that address the "Likelihood" factors that increase the probability of a potential incident and the "Impact" factors that describe the consequences to the public and to environmental resources. The relative risk model was based on the W. Kent Muhlbauer ("Pipeline Risk Management Manual, Second Edition") risk model, presented in a separate document (Excel format). HECO chose variables it deemed appropriate to adequately characterize the relevant risk factors for each of the five risk segments, including information necessary to determine the potential for internal/external corrosion, third-party damage, outside force damage, operations, design/materials, and potential leak impact. The answers and numerical weights to each question and category are based on the most recent information available, site-specific conditions that exist, and SME-derived relative weighting. A Relative Risk Score is then calculated for each segment.

The excel-based Risk Model provides a logical, structured, and documented process, as well as data evaluation guidelines for SMEs to consistently apply the risk model during future iterations. The model focuses on the risk to safety and environment, and does not incorporate "non-safety" risk factors such as those associated with business and economic risks.

These risk scores will be used by HECO to prioritize the pipeline segments for repair, prevention, and mitigation actions. Since all HECO segments are within one assessment section, the integrity assessment will be conducted on the entire Iwilei pipeline. A more comprehensive risk assessment will be performed after completion of the baseline assessment, and will be used for identifying and evaluating additional P&MMs.

3.5 Facility Risk

As required by 49 CFR 195.452, HECO has included in their IMP an evaluation of facility risk. HECO interprets jurisdictional facilities to include pipeline stations and terminals, specifically DOT-jurisdictional breakout tanks and associated appurtenances.

HECO operates two DOT-jurisdictional facilities, the IFSF and HPP. The facilities include one LSFO and three diesel breakout tanks, plus associated jurisdictional appurtenances. The IFSF is manned with personnel from HPP when any transfer operations are in progress. LSFO is stored in one 79,224 bbls breakout tank (Tank No. 2) and is then transferred via pipeline to HPP. Displacement oil (#2 diesel fuel) is stored in two 450 bbls tanks (Tank Nos. 3 & 4) at IFSF and one 1,000 bbls tank (Tank No. 7) at HPP and is used to displace LSFO from the pipeline after each LSFO transfer. Secondary containment is provided for all bulk oil storage tanks and all active piping at the facility.

The facility risk analysis is similar in nature to the main line pipe, in that it must assess the likelihood and consequence of failure mechanisms that could affect an HCA. API Standard 1160, Section 12, API Publication 353, Managing Systems Integrity of Terminal and Tank Facilities, First Edition, and API Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction were utilized to determine the applicable data to collect for evaluation of facility risk. The HECO Facility Risk Assessment model (Excel format) provides an organized outline for HECO SMEs to conduct the facility risk assessment. During the risk assessment meeting, the risk assessment model identifies individual likelihood and consequence risk variables associated with a particular component of the facility (i.e. breakout tanks, DOT-jurisdictional valves, site security and complexity, systems operations, emergency response, etc.). SMEs populate the Facility Risk Assessment Model spreadsheet by selecting the most appropriate response following discussions on each topic/risk variable. The results are documented in the Facility Risk Assessment Model spreadsheet along with relevant information and comments.

HECO tanks are governed by API 653. Appropriate inspections are conducted per API 653. HECO follows all recommendations resulting from the API 653 inspection, reviews all data, and continues the IM process as detailed in section 6 of this manual.

Facility components are governed by HECO's O&M Program (see HECO's Operations and Maintenance Compliance Manual under separate cover), which is in compliance with 49 CFR 195. HECO performs O&M activities including right-of-way inspections, pipe-to-soil potential surveys, rectifier checks, valve maintenance, tank overfill alarm testing, pump maintenance, etc. HECO reviews all data and continues the IM process as detailed in section 6 of this manual.

3.6 Risk Analysis Process

Within 1 year after the completion of baseline and subsequent integrity assessments, a risk analysis must be performed for each segment and facility component. The Risk Assessment Models will be used for risk and information analysis and evaluation of P&MMs. In addition, HECO will evaluate risks associated with each mode of operation (startup, shut-down, static, and idle line). Risk analysis must be performed by qualified HECO personnel, SMEs, and third-party consultants, if necessary. The IMP Coordinator will lead the effort in performing the information analysis and risk evaluation.

The Risk Analysis Process consists of these steps:

1. Confirm Segment Boundaries. Segment boundaries used in the initial screening assessment must be confirmed and updated, if necessary.
2. Collect and Integrate Latest Available Data. This includes information on the pipeline system and facility components, and surrounding environment and population, past equipment failures, incident data, CP data, ILI results, and other information that gives an indication of the condition of the pipeline. Maps that show specific areas of concern for the risk assessment such as environmentally sensitive areas, areas with natural and geological hazards, areas of dense population, recreational areas, and information regarding new HCA locations that may impact segment boundaries will also be reviewed.
3. Review Factor Weightings and Values. HECO will review the weightings and values assigned to each of the factors to ensure that they accurately represent HECO's pipeline and facility risks.
4. Populate Risk Model and Assign Relative Risk Rankings. HECO will conduct SME meetings to assign scores to each risk factor. HECO will use the most recent information available and avoid making subjective assumptions as much as possible. Information used for each risk assessment will be documented using within Pipeline Risk Model and Facility Risk Model spreadsheets.
5. Validate Risk Analysis Results. HECO must validate the risk analysis and ensure that methods used to evaluate and assess risk have produced results that make sense and are consistent with HECO's experience. If the risk analysis results do not make practical sense, HECO will review the core risk data for accuracy and/or revise factor scores or weightings.
6. Determine Risk Drivers. The most likely risk drivers for the highest risk locations will be identified and their underlying causes will be analyzed during the P&MM evaluation process.
7. Document and Communicate Risk Analysis Results. The data that is evaluated, relative risk scores, risk factors, and conclusions must be documented in the Risk Model spreadsheets. Results will be integrated into the reassessment interval determination and the P&MM evaluation. The IMP Coordinator is responsible for documenting and distributing the results to the appropriate HECO personnel.

The Relative Risk Models are not used as a primary tool for decision making. HECO uses a comprehensive Risk Assessment and P&MM Evaluation process described in Section 6, Risk Management - Prevention and Mitigation. The Relative Risk Models are maintained and updated for quick reference purposes and can be used as a tool when communicating the IMP status to HECO's Management (See Section 8, Program Evaluation).

3.7 Annual Risk Review

The IMP Coordinator will review the following data annually to determine the need for updating risk:

- Pipeline and facility design changes;
- Operations and commodity changes;
- Integrity assessment and repair results;
- Completed API 653 tank inspections and/or maintenance activities;
- Cathodic protection information;
- Internal corrosion coupon data (if applicable);
- Population growth or other HCA changes along the ROW;
- Other relevant pipeline and facility integrity information.

Changes made to the input information and/or analytical tools and methods must be justified and documented by the IMP Coordinator, in according to the requirements detailed in Section 9.

6.0 RISK MANAGEMENT – PREVENTION AND MITIGATION

6.1 Purpose

This section describes the process for identifying, evaluating, and selecting measures to be taken to prevent and/or mitigate consequences of a pipeline or facility failure that could affect an HCA. It also defines a process for the evaluation of leak detection system capabilities and the need for upgrades, as well as the evaluation of the need for installation of additional EFRDs.

6.2 Approach to Risk Prevention and Mitigation

The intent of HECO's IMP is to facilitate the proactive maintenance of the pipeline system and its integrity, and to address potential problems. The objective is to improve management and analysis processes that integrate all available integrity-related data and information, and assess the risks associated with pipeline and facility segments that can affect HCAs. In addition, HECO will evaluate additional risk control measures designed to protect HCAs by preventing the release of product, and understanding the consequences of such a release.

Examples of these additional measures include enhanced damage prevention programs, reduced inspection intervals, corrosion control program improvements, leak detection system enhancements, tank inspections performed in accordance with API Standard 653, installation of Emergency Flow Restricting Devices (EFRDs), and emergency response improvements.

In order to effectively perform the evaluation of P&MMs, the integrity assessments and risk analysis must be completed. Evaluation of P&MMs will be performed after completion of post-assessment risk analysis, but no later than 18 months after receiving and integrating the results from the assessment. The documented risks and applicable pipeline and facility threats, as well as a list of all existing and scheduled P&MMs is maintained by the IMP Coordinator and updated at least annually.

6.3 Risk Factors for P&MM Evaluation

When performing the evaluation of potential P&MMs, HECO considers the following factors (* indicates factors specifically required by 49 CFR 195.452(i)(2)):

- Terrain surrounding the pipeline segment (including drainage, small streams, and smaller waterways that could act as a conduit to a HCA)*;
- Elevation profile*;
- Characteristics of the product transported*;
- Amount of product that could be released*;
- Possibility of a spillage in a farm field following the drain tile into a waterway*;
- Ditches alongside a roadway the pipeline crosses*;
- Physical support of the pipeline segment such as by a cable suspension bridge*;
- Exposure of the pipeline to operating pressure exceeding established MOP*;
- External and internal corrosion;
- Third party damage;
- Operator or procedures error;
- Equipment failures;
- Natural force damage;
- Stress corrosion cracking;
- Materials problems;
- Construction errors;
- Various operating modes;
- Population impacts;
- Environmental damage;
- Property damage.

The HECO Risk Assessment Model includes all the above factors and incorporates them through information analysis when evaluating P&MMs, documented on FR-IMP-05, Risk Assessment and P&MM Evaluation form, in Appendix C.

6.4 Identification of Risk Drivers

The IMP requires that the decisions on P&MMs be risk based. These decisions require a clear understanding of the likelihood and consequences of a failure for each segment. The risk analysis must clearly indicate whether the risk is driven by higher consequence of failure (due to particularly sensitive areas, proximity to water, or especially toxic materials) or due to higher frequency of failure (due to highly corrosive environments, higher than average potential for damage, etc.). Consideration should be given not only to worst case scenarios, but also most likely scenarios.

Risk drivers can be identified by HECO's Pipeline Relative Risk Model, Facility Risk Model, and by SME's during Risk Assessment and P&MM Evaluation meeting (by discussing each threat/risk factor on the P&MM form FR-IMP-05, in Appendix C). Before evaluating the relative impact of a proposed P&MM, HECO must review the most recent risk analysis results and verify that all pipeline and facility data and configuration assumptions are up-to-date.

6.5 Selection of Preventive and Mitigative Actions

To identify, select, and evaluate additional P&MMs, HECO conducts an SME meeting within 18 months after completion of the integrity assessment. The comprehensive risk assessment and P&MM evaluations are conducted as one meeting. The Relative Risk Models for pipeline and facility must be updated prior to the meeting and are used as an objective reference tool during the decision making process. Other events and activities, such as actual leak data, unsatisfactory mitigation of a failure, or information obtained through other inspections or close calls, may indicate the need for an "ad-hoc" evaluation.

HECO will gather information on existing P&MMs already in place and their effectiveness in reducing risks of pipeline or facility failure. HECO will evaluate the outputs from the risk assessment on a pipeline system or segment-specific basis to determine possible risk mitigation actions. In addition, HECO will review any completed operations and maintenance activities performed on the pipeline and/or facility components, and any completed API Standard 653 inspections/ maintenance on the tanks. Mitigative actions can also be identified during normal pipeline operation. Emphasis will be put on reducing high likelihood and high consequence conditions as much as possible. Therefore, different risk mitigation scenarios can be developed and evaluated for effectiveness.

If appropriate, HECO can develop and use the frequency-consequence matrices (see Figure 6-1), to evaluate particular risk scenarios and provide a decision basis for evaluating mitigation alternatives, if additional justification and management approvals are necessary. Risk scenarios with high likelihood and/or high consequences may need additional P&MMs. HECO can also utilize the algorithm in the Risk Assessment Model to evaluate the potential risk reduction of these P&MM alternatives, if necessary.

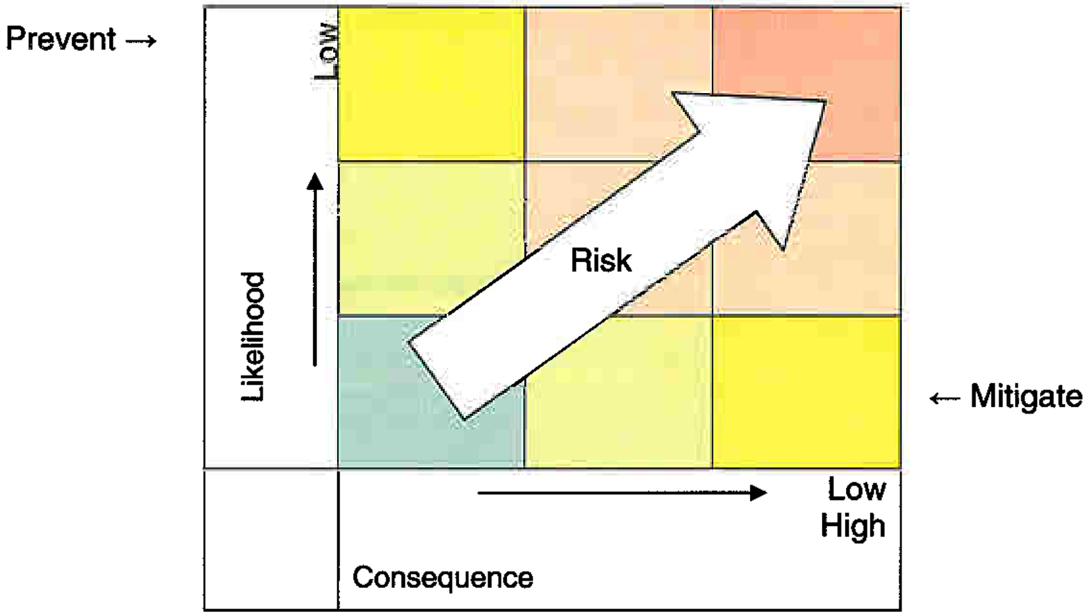


Figure 6-1, Simple Risk Matrix

HECO may choose to perform cost comparisons or conduct a benefit analysis for multiple risk-reduction alternatives for a given scenario. When selecting appropriate alternatives, HECO shall consider the following possible modifications, ranging from incremental changes to major improvements:

- Enhancements and upgrades to existing measures already in place;
- Changes to work processes, review of documented procedures, emergency response plans, etc.;
- Physical changes to the pipeline or facility components and/or configuration;
- Increase in inspection frequencies or monitoring;
- Other preventive or mitigative actions based on specific threats.

Example P&MMs include the following:

- Preventive Measures (provides reduction in probability) - damage prevention, increased monitoring of cathodic protection, API Standard 653 tank inspections, shorter inspection intervals, etc.
- Mitigative Measures (provides reduction in consequence) - installing EFRDs, improved leak detection, improved training on response procedures, emergency response drills with local emergency responders, improved management controls.

After determining the appropriate alternatives, HECO must develop a P&MM implementation schedule and prioritize the activities based on HCA segment risk rank and potential risk-reduction benefit.

6.6 Implementation and Documentation

HECO must document the process for determining the appropriateness of existing activities in place and the need for additional preventive and mitigative actions. The IMP Coordinator is responsible for generating P&MM Evaluation Reports to document all candidate P&MMs that have been considered, including those that have not been implemented. The document should include technical justifications or validations of key assumptions, references to industry standards, etc. HECO must document the decision basis regarding how much benefit (e.g., risk reduction, reduction in threat to integrity, etc.) is necessary for additional actions to be evaluated for potential implementation.

Approved preventive and mitigative actions must be closely integrated with the other HECO organizational elements responsible for scheduling and implementing the approved actions (e.g., budgeting, project management, damage prevention, health and safety, operations and maintenance).

The scope and schedule of additional actions must be prioritized on highest risk segments. Implementation of approved additional actions must be performed as planned and scheduled.

Implemented preventive and mitigative actions and their results must be integrated back into the IMP by inputting them into the Risk Assessment Model in order to evaluate their effectiveness and risk reduction value. HECO must document the evaluation results, along with the proposed changes to the system. The documentation provided must include the technical justification of assumptions, any references to internal HECO's documents, regulatory citations, or industry standards. Upon completion of the evaluation, all program action items shall be assigned to a specific project manager, and shall include milestone activities and anticipated schedule. Ongoing schedule tracking, including unanticipated delays and related justification, shall be performed and documented to assure that required activities are implemented accordingly.

The Risk Assessment and P&MM Evaluation form FR-IMP-05 in Appendix C provides a structured, systematic approach for evaluating all threats and required factors, as well as documenting existing and proposed P&MMs. Selected P&MMs are tracked on a separate spreadsheet (Excel format), and include measure description, assigned responsibilities, target dates, and implementation status. The P&MM form and spreadsheet must be updated at least annually.

6.7 Current and Ongoing Routine P&MM Measures

The following summarizes ongoing prevention and mitigation programs that are currently a part of HECO's IMP process (more detailed P&MMs are documented as described in Section 6.6).

6.7.1 Spill Response Planning

HECO is a member of the CIC and the Marine Spill Response Corporation. The CIC is funded by numerous companies and maintains personnel and equipment to plan for and respond to spills.

6.7.2 Prevention of Third Party Damage

One-Call Utility Location Systems

To minimize the potential for third party damage, HECO participates in the one-call utility location system on the Island of Oahu (Hawaii One Call Center). One-call inquiries to HECO are received by the IMP Coordinator who determines if the HECO pipeline may exist at the excavation site. The IMP Coordinator then is responsible for making a reply to the inquiry. All inquiries received and the actions taken by HECO are documented appropriately and the documentation retained in a binder. HECO will similarly utilize the one-call system prior to any excavation activity it undertakes. HECO will evaluate the historical frequency and location of one-call activity to determine the effectiveness of the system. HECO was actively involved in supporting legislation to create a mandatory one-call system that went into effect in 2004.

Line Marking

Line marking is conducted in accordance with HECO's Pipeline O&M procedures. Line marking frequency and effectiveness is to be evaluated in combination with the one-call system evaluation.

Public Awareness Program

Public education and community awareness programs are described in HECO's Public Awareness (PA) Program Manual, designed to meet API Recommended Practice 1162, Public Awareness Programs For Pipeline Operators, requirements. An annual mailing is issued to the excavators, emergency responders, and government officials in the area of the pipeline and residents and business adjacent to the Iwilei pipeline ROW receive mailings every other year. A list of contractor addresses is maintained in HECO's PA manual. HECO is a member of the Hawaii Pipeline Corrosion Control Coordinating Committee (4C's) and the Iwilei District Participating Parties, LLC (IDPP). IDPP was organized to effectively manage environmental investigations and response activities in the Iwilei District. IDPP also raises public awareness efforts, with oversight of the Hawaii DOH, The Hawaii Environmental Response Law, and the State Contingency Plan. Examples of these efforts have consisted of preparing a Community Relations Plan and periodically providing written information fact sheets to owners and tenants of neighboring properties and interested parties. Briefings have also been provided by the IDPP to the Honolulu Fire Department and state and county public officials.

ROW Maintenance

ROW inspection is conducted in accordance with HECO's Pipeline O&M Manual procedures. Pipeline patrol reports are reviewed by the Operations Supervisor or designee, and maintained for integration into the risk analysis process.

Bridge Span Evaluations

The pipeline spans one stream, Nuuanu Stream, and is supported by steel supports on an extension of the bridge pier. The pipeline is clamped to the supports. HECO conducts ROW inspections, which ensure the pipeline is not damaged and that the overall bridge and support system is adequate to protect the pipeline. Because the Honolulu side of the pipeline under the bridge is often used as a shelter for homeless people, and because a leak in this area would disperse directly into a navigable waterway, increased mitigation efforts were taken for this portion of the pipeline. The pipeline in this area was replaced with Schedule 80 pipe to allow for increased corrosion allowance and the insulation in this area was fortified with an aluminum jacketing. These measures have proven effective in reducing potential damage for this portion of the pipeline to date, and will continue to be evaluated for effectiveness based on results on pipeline inspections and assessments.

Measures were taken to restrict access to the pipeline under the bridge by building a cage around the pipeline.

6.7.3 Corrosion Control

Internal Corrosion

Internal corrosion threat is low, as evidenced by numerous ILI assessments and cut-outs. As a result of this, no inhibiters are used in the product and internal corrosion coupons are not required. All jurisdictional tanks are included in the API Standard 653 program.

External Corrosion

External corrosion is a potential threat to the pipeline. Mitigation activities for the external corrosion include ongoing assessment, maintenance, and repair of the CP system, assessment and repair of external coating, and pipeline repairs or replacements when significant external corrosion is identified by in-line inspections. CP system consists of impressed current, 21 test stations, 2 anode beds, and 2 rectifiers. In addition, HECO is a member of the 4C's committee that is comprised of other pipeline and utility companies to ensure that CP interference and other issues are communicated and resolved in a timely manner.

All corrosion control activities are conducted in accordance with HECO's Pipeline O&M Manual procedures. All jurisdictional tanks are included in the API Standard 653 program.

6.8 Leak Detection

HECO designed and implemented an improved leak detection monitoring system for use during product transfer. The new system includes coriolis flow meters, pressure transducers, recorders, and totalizers to create a continuous pressure recording and fuel flow measurement system. The new monitoring system significantly improved response time in the event of significant leaks during pumping. The system is not designed to detect small leaks on this pipeline. Rather this must be done by visual inspection and ROW inspections during pumping operations.

To evaluate leak detection capabilities, the following factors will be considered for "worst case" scenarios (* indicates factors required by 49 CFR 195.452 (i)(3)):

- risk assessment results*;
- swiftness of leak detection*;
- time required to detect the release
- location of nearest response personnel*;
- pipeline length and diameter*;
- product in pipeline*;
- proximity to HCAs*;
- leak history*;
- current leak detection method for the HCA areas;
- use of SCADA;
- thresholds for leak detection;
- flow and measurement pressure.

Additional evaluation will be performed on "most likely" and other leak scenarios as necessary:

- specific procedures for lines that are idle but still under pressure,
- additional leak detection means for areas in close proximity to sole source water supplies,
- testing of leak detection means (such as physical removal of product from the pipeline),
- evaluation of leak detection performance under transient conditions,
- evaluation of the operational availability and reliability of the leak detections systems,
- evaluation of the operator's process to manage system failure,
- considerations of enhancements to existing leak detection capability.

HECO has evaluated its leak detection system and determined that it is considered adequate for current operating conditions; refer to Leak Detection Evaluation Report (provided under separate cover). This Report will be reviewed and updated, if necessary, by HECO's SMEs during risk assessment and P&MM Evaluation process.

HECO is a member of the CIC who provides comprehensive spill response activities. Numerous companies on the island fund the CIC, and CIC's response contractors. CIC maintains personnel and equipment to respond to spills, and as such, have been designated as the first responder in the case of a product release. CIC provides routine training and drills, and files spill response plans prepared by the member companies. CIC is designated to respond to spills of product up to 2,400 barrels. Spills greater than 2,400 barrels are contracted to SEACOR who has equipment throughout the United States.

6.9 Emergency Flow Restriction Devices (EFRDs)

EFRDs such as check valves are not used on the Iwilei pipeline. Normal operation of the Iwilei pipeline requires flow in both directions, so check valve type EFRDs cannot be used. Due to the extremely short length of the pipeline, and the flat terrain, no motor-operated valves (MOVs) or remotely controlled valves (RCVs) have been installed. The need for additional EFRDs will continue to be evaluated as part of the integrity management process.

It is important to understand that EFRDs are designed to mitigate catastrophic, large-volume releases. Not all threats to pipeline integrity would be expected to result in a catastrophic release, for example, leaks that result from typical corrosion anomalies, leaking pump seals, leaking valve tubing, etc., would not be effectively mitigated by installing additional EFRDs. Therefore, the SMEs must make a determination whether the specific threat(s) could be significantly mitigated by installing an EFRD. The following are those threats that might result in a catastrophic release from a pipeline:

- Over pressure control device failure (equipment);
- Seam failure (material & weld);
- Stress corrosion cracking (external corrosion);
- Third-party damage (outside force);
- Adverse weather conditions (natural force);
- Land movement (natural force).

Factors that will be considered in the evaluation of additional EFRDs include (* indicates factors required by 49 CFR 195.452(i)(4)):

- leak detection capabilities*;
- shutdown capabilities*;
- product in pipeline*;
- potential leakage rate*;
- potential leakage volume*;
- topography and pipeline profile*;
- potential for ignition*;
- proximity to power sources*;
- location of response personnel and materials*;
- benefits from reducing the spill size*;
- reliability of existing MOVs;
- operating modes;
- system detection times, operator response times, remotely controlled valve response characteristics, and system isolation time;
- need for additional EFRDs to respond to releases during transient conditions;
- conducting proper valve sequencing during intended EFRD activations;
- ability to promptly detect and react to inadvertent EFRD activations;
- possible elevated pressures caused by transient conditions during EFRD activations.

HECO must document the evaluation results, along with any proposed changes to the system. The documentation provided must include the technical justification of assumptions, any references to internal HECO's documents, regulatory citations, or industry standards. Upon completion of the evaluation, all program action items shall be assigned to a specific project manager, and shall include milestone activities and anticipated schedule. Ongoing schedule tracking, including unanticipated delays and related justification, shall be performed and documented to assure that required activities are implemented accordingly.

HECO has evaluated existing valve locations on its system and determined that it is considered adequate for current operating conditions; refer to EFRD Evaluation Report (provided under separate cover). This Report will be reviewed and updated, if necessary, by HECO's SMEs during risk assessment and P&MM Evaluation process.

6.10 Tank Overfill Protection

Tank overfill device inspection and testing is performed in accordance with §195.428(d), and is a "covered task" under HECO's Operator Qualification Program. The high tank alarms consist of float-type safety devices that trigger an audible alarm in the control room. Each overfill device is inspected, tested, and/or replaced one time per calendar year, not to exceed 15 month intervals. The inspection/testing confirms that overfill protection equipment is functioning properly, is in good mechanical condition, and is adequate from the standpoint of capacity and reliability of operation for the service in which it is used.

6.11 Breakout Tank Inspection, Maintenance, and Repair

Breakout Tank inspection, maintenance, and repair is performed in accordance with §195.432. A routine in-service inspection of breakout tanks in accordance with API 653 is performed at intervals not to exceed one month. This inspection includes, but is not limited to, a visual inspection of the tank's exterior for: leaks; shell distortions; signs of settlement; corrosion; and condition of the foundation, paint coatings, insulation system and appurtenances. Visual External Inspections, as well as out-of-service Internal Inspections, are performed by an Authorized Inspector in accordance with API 653, Section 4.

10.0 REFERENCES

The following industry and regulatory documents are included by reference in this Manual:

- Advisory Bulletin ADB-03-02, Required Submission of Data to the National Pipeline Mapping System Under the Pipeline Safety Improvement Act of 2002
- Advisory Bulletin ADB-08-07, National Pipeline Mapping System Submissions
- Advisory Bulletin ADB–03–05, Stress Corrosion Cracking (SCC) Threat to Gas and Hazardous Liquid Pipelines
- AGA Pipeline Research Committee Project PR-3-805, A Modified Criterion for Evaluating the Remaining Strength of Corroded Pipe
- API Specification 5L, Specification for Line Pipe
- API Standard 653, Tank Inspection, repair, Alteration, and Reconstruction
- API Recommended Practice 1162, Public Awareness Programs for Pipeline Operators
- API Standard 1160, Managing System Integrity for Hazardous Liquid Pipelines
- API Publication 353, Managing Systems Integrity of Terminal and Tank Facilities
- API Standard1163, In-Line Inspection Systems Qualification Standard
- API Recommended Practice 1162, Public Awareness Programs For Pipeline Operators
- ASME B31G, Manual for Determining the Remaining Strength of Corroded Pipelines
- ASME B31.4, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
- NACE RP-0502-2002, External Corrosion Direct Assessment (ECDA)
- NACE RP-0102-2002, In-Line Inspection of Pipelines
- W. Kent Muhlbauer, Pipeline Risk Management Manual, Second Edition

HECO must ensure that the above documents are readily available to be used by HECO's personnel responsible for IMP-related activities.