Chevron will require DRA injection to their outgoing pipeline. The specification and design of the DRA Skid will be based on previous packages successfully used on Chevron facilities. The skid will consist of multiple chemical storage tanks housed within a climate-controlled building. The storage tanks include motor driven agitators to keep the chemical mixed per the chemical supplier's instructions. Motor driven charge and injection pumps will be used to inject the chemical into the pipeline. The skid will include containment, but the drain will not be tied into the facility Sump or Slop Tank. Due to adverse impacts of the chemical mixing in the Sump, the skid drain will include an isolation valve that allows for the containment to be pumped into a disposal tank.

6.3 Civil & Structural Design

6.3.1 Soils and Foundations

A site-specific geotechnical investigation for the area will be completed. In the select project phase, open-ended steel pipe piles were chosen. Capacities will be determined from the geotechnical report as well as depth and diameter of piles. The geotechnical report shall indicate any pile installation recommendations, along with estimated settlement values.

A scour depth of 5'-0" is to be assumed in design.

6.3.2 Deck Design

The main deck area will be approximately 180'Wide x 80'Long. The main deck will be designed as modular steel platform consisting of five (5) modules installed above truss beams and piles. The five (5) modules are described as follows: Utility Module, Incoming P/L Receiver Module, Amberjack Metering Skid Module, Chevron Metering/Prover Skid Module and Chevron HLS & Launcher Module. Design life of the structure is 50 years based on pile corrosion allowance provided in the design.

The decision to construct the platform out of steel was made on August 13th, 2020 via an Option Risk Assessment Meeting attended by various Shell stakeholders and Audubon representatives. The four options discussed were steel deck, concrete (Waskey) deck, Hybrid (steel piles with Waskey deck or vice versa), and Jacket structure with topsides. Eight criteria were ranked and given a weight using the Row Geometric Mean Method, the four options were then evaluated with the eight criteria. The option with the highest weighted average was jacket structure with steel topsides.

The main deck bottom of steel at a minimum will be at Elevation (+) 20-1 1/4" as stated in the Metocean Study in Appendix C. The deck will be steel, to facilitate ease of future modifications and additions. Final platform elevation shall account for subsidence and settlement as provided in the geotechnical report.

Modules will be designed with grating walking surfaces and spaced with gaps between the modules for future maintenance. The gaps will be filled in with grating walking surfaces. Drip pans will be installed under the Amberjack Receiver and Chevron Launcher. Containment will be provided for the Amberjack Meter Skid, Chevron Meter and Prover Skids, and the Diesel Storage and Supply Skid.

Access to the deck will be by stairs from the ground level at both ends of the facility. The new facility will not have a helideck, crane or boat landing at this time however, general arrangement drawings will indicate future location of these items.

6.3.3 Materials

Materials shall be as follows:

- Rolled shapes: ASTM A36 / A992
- Plates: ASTM A36 / API 2H-50 / ASTM A572 Gr. 50 / API 2W GR 50Z

- Pipes: API 5L X52 with SR5 or SR6 / API 5L Gr. B / ASTM A-53 Gr. B, API 5L X42, API 5L X52
- HSS Tubes: ASTM A500 Gr. B
- Grating: 1-1/4" x 3/16 x 1-3/16 serrated bar, galvanized
- Bolts: ASTM F3125, Grade A325

All pipe piles shall be API 2H-50 or API 2W Gr 50Z material including supplementary requirements S-1, S-4, and S-5. All primary deck beams shall have a CNV 25 lb-ft at 32°F.

6.3.4 Loading

6.3.4.1 Metocean Criteria

A metocean study has been conducted for this facility, which includes projections of future water elevations, wave heights, and current speeds. Reference Appendix C.

The structures will be designed in accordance with API RP 2MET (2nd edition) "Derivation of Metocean Design and Operating Conditions" and API RP 2A (22nd edition) "Planning, Designing, and Constructing Fixed Offshore Platforms – Working Stress Design" for a 1000-year return period storm. Additionally, since the structure is currently onshore, the design must also meet the requirements of ASCE "Minimum Design Loads and Associated Criteria for Buildings and Other Structures." Louisiana currently adopts the 2010 version of this code, but the metocean report specifically references the 2016 version. Since the 2016 version has a higher wind load for Risk Category IV, ASCE 7-16 will be used.

Design environmental parameters for Survival (1000-Yr) Conditions are as follows:

- Max Water Elevation (wave crest): 6.10m (20.1 ft)
- Height of Maximum Wave (1000 yr Storm): 1.52 m (5.0 ft)
- Period of Maximum Wave: 15.6 sec
- Recommended Minimum deck Bottom of Steel Elevation: 6.1 m (20.1 ft)
- 1000-Yr Survival Storm Wind Velocity: 87 m/s (194 mph) (3-sec gust @ 10m, Risk Category IV)
- 1000-Yr Survival Storm Flow Velocity: 2.6 m/s (8.5 ft/s)

Design environmental parameters for Extreme Storm (100-Yr) Conditions are as follows:

- Max Water Elevation (wave crest): 5.19m (17.1 ft)
- Height of Maximum Wave: 0.94 m (3.1 ft)
- Period of Wave: 15.5 sec
- 100-Yr Storm Wind Velocity: 80 m/s (179 mph) (3-sec gust @ 10m)
- 100-Yr Storm Flow Velocity: 2.0 m/s (6.6 ft/s)

Design environmental parameters for Operational and Installation (10 Yr) Conditions are as follows:

- Max Water Elevation (wave crest): 1.44 m (4.7 ft)

- Height of Maximum Wave: 0.04 m (0.13 ft)
- Period of Wave: 13.7 sec
- 10-Yr Storm Wind Velocity: TBD m/s (TBD mph) (3-sec gust @ 10m, Risk Category IV)
- 10-Yr Storm Flow Velocity: 0.63 m/s (2.1 ft/s)

No significant seismic activity.

6.3.4.2 Dead & Equipment Loads

Self-weight of steel + 5% margin for mill tolerance. Include grating / plating weight. Preliminary estimates for equipment/skid loads will have a 15% margin, design estimates for equipment skid loads will have a 10% margin, and final calculation loads from equipment/skid vendor will have a 5% margin. Piping / tray bulks (20 psf minimum, or as per material take-off).

6.3.4.3 Live Loads

Deck beams will be designed for a minimum 150 psf live load, or higher as determined from actual equipment / skid loads except as specified in the following sections.

Laydown areas will be designed for a minimum 400 psf live load, or higher as determined from actual payload estimates.

Primary steel, such as deck trusses and piling will be designed for a 75% carrydown factor for open area live loads when combined with operational environmental loads, a 50% carrydown factor for open area live loads combined with 100-year storm environmental loads, and a 25% carrydown factor for open area live loads combined with 1000-year storm environmental loads.

Secondary steel, such as deck beams, will be designed for 100% of live loads when combined with operational environmental loads, and a 50% carrydown factor for open area live loads combined with 100-year storm environmental loads, and a 25% carrydown factor for open area live loads combined with 1000-year storm environmental loads.

6.3.4.4 Material Handling Loads

The new elevated facility will require additional materials handling equipment for normal operations. Pigging operations that were normally executed with vehicles and jib cranes will require apparatus to raise and lower the pigs from the facility. Fluid filling methods have not been confirmed yet, but chemical, diesel, and water totes will need to be lifted on and off the facility. Additionally, general facility maintenance will require lifting at various locations across the facility. A crane is not currently included in the project scope, so the addition of a platform crane would likely require a separate four-pile structure.

6.3.4.5 Analysis Requirements

The following analyses will be performed:

- In place (operating, extreme storm, & survival storm)
- In-place Dynamic to determine fundamental periods.
    - Periods should not exceed 3.0 seconds

- Joint Can punching shear check, if applicable.
- Dynamic Spectral Fatigue
- Loadout – skidding of decks(***)
- Lift (***)
- Transportation (***)

Fatigue service life will need to be calculated based on updated wave loading now that approximately half of the structure is in the water. The metocean report will need to be updated to include wave loading parameters. Fatigue will be studied and connections will be detailed appropriately. However, analysis may prove fatigue results to be negligible. Safety factors will be per API RP 2A.

***Note: The current plan is for the piles and primary truss framing to be stick-built on site. Modules will be fabricated offsite and will require a load-out, lift, and transportation analysis.

For the design checks using API RP 2MET, a one-third allowable increase is used for the survival and extreme storm conditions, and barge transportation. No increase in allowable stresses will be utilized for operating, lift cases, loadout and highway transportation. An allowable increase is not allowed for the design checks using ASCE 7-16.

All modules and equipment will be designed for offshore lift impact loads per API RP 2A. Variations in sling lengths will be considered in the design. A load factor of 2.0 will be used for the lifting eyes, and for all structural members directly attached to the lifting eyes. A load factor of 1.35 will be used for all remaining structural members. In all cases, beam deflections will be limited to L/240 for simply supported and L/180 for cantilevered beams.

The deck, equipment, skids, and all tie-down braces shall be designed to resist the appropriate transportation accelerations, heave, pitch, and roll as determined by the Noble Denton marine transportation guidelines for the transportation vessel. Tie-down braces shall land directly over a barge bulkhead. Roll plus heave and pitch plus heave cases are to be checked.

6.3.4.6 Future Design Considerations

The new facility will not have a helideck, crane or boat landing at this time. However, these items will be coordinated and planned for their potential future locations. If it is determined that a crane is needed in the future, a new, stand-alone 4 pile structure can be installed adjacent to main deck. The new crane platform would tie-in to the existing platform via walkway only.

6.4 Mechanical

6.4.1 Piping and Valve Specification and Selection

A project specific piping specification will be developed for ANSI 600#, ANSI 900#, and ANSI 1500# classes. The specification will be based on ASME B31.4 and Shell Pipeline specification 5TS-009. Utility piping will be based on existing the Shell Schedule Q specification.

The intent is to match the existing piping components and configuration as much as practical. The incoming pipelines, receivers, and launchers will be routed as needed to match the new facility, but the Chevron Meter and Prover Skid and Amberjack Meter Skid will be replicas based on their original design drawings.

Manual Valve selections are intended to match the existing valves used in the facility and are per SPLC spec 6TS-001.

6.4.2 Equipment Design and Selection