CASES NO. 20313, 20314, 20472, 20460, 20463, and 20465
Division Exhibit No. 11

Guidelines for Permitting Salt Water Disposal Wells in the Permian Basin

An Overview Presentation to TXOGA

April 17, 2019

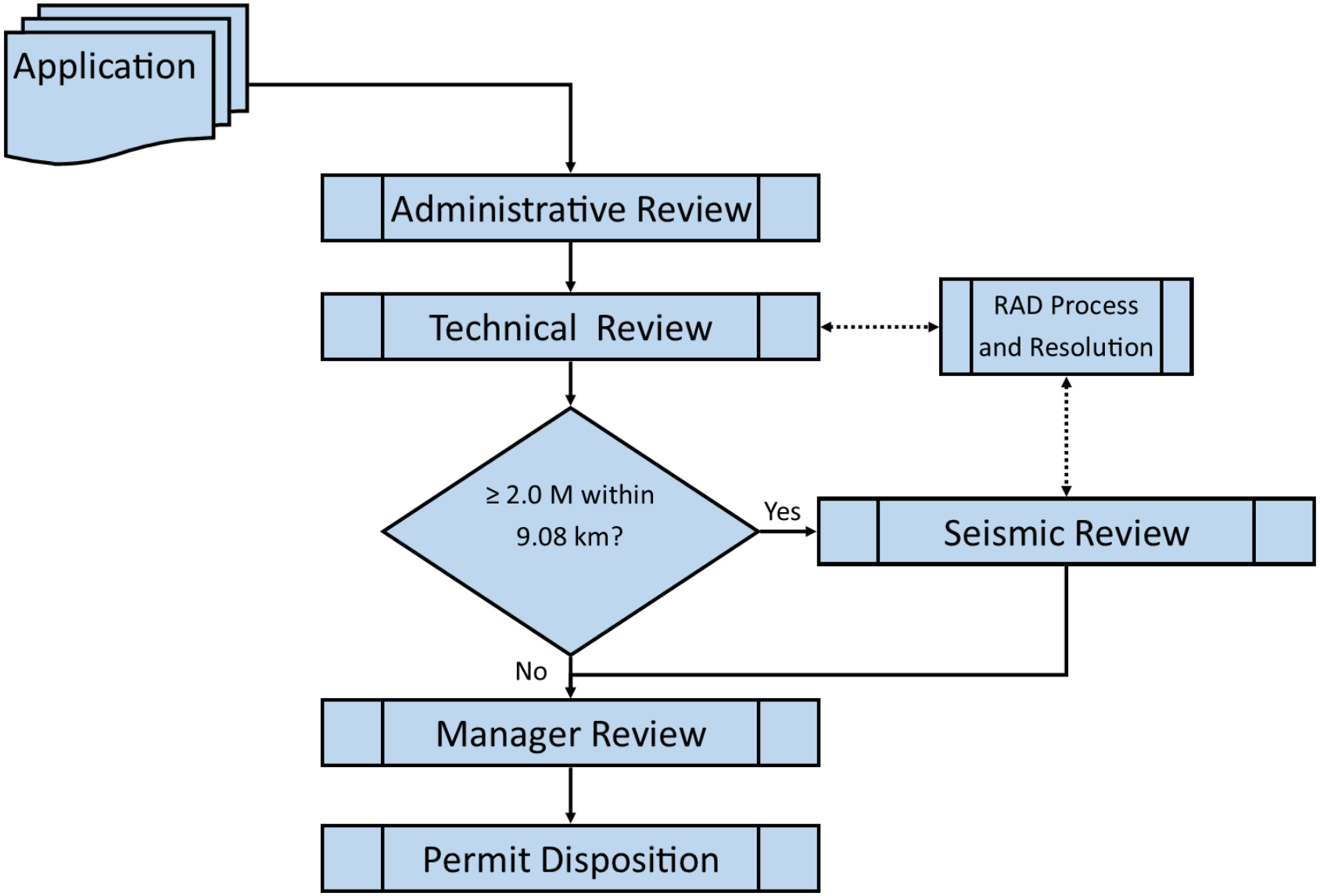
Guidelines – Internal

- Internal guidelines to assist RRC staff with administrative processing and permitting of disposal well applications in areas of the Permian Basin that are experiencing seismic activity
- These guidelines will enable RRC staff to review and process disposal well applications consistently, fairly, more timely
- Not written to be guidance or instruction for industry applicants.

Guidelines Status

- Development began early 2018
- Development accelerated Summer 2018
- Aides briefings in September 2018
- Limited external peer review Fall 2018
- Continued peer review January 2019
- Green light to pilot February 2019
- Anticipate full implementation Summer 2019

UIC High-Level Processes



UIC Review Elements

- Admin: Are the elements of the application present and complete?
- Technical: Do the elements of the applications meet the requirements of Rule & Statute?
- Seismic: Based on an assessment of potential seismic hazard, are special permit conditions warranted? If so, what are they?
- Manager: Final decision
- Permit Disposition: Approve, deny, refer

Disposal Well Application Elements

- Rule 9 disposal well
  - Form W-14
  - $250 (Fee + Surcharge)
- Rule 46 disposal well
  - Form H-1/H-1A
  - $500 (Fee + Surcharge) per wellbore
- Extra fees may be required if rule exceptions are requested ($375 per exception)

Disposal Well Application Elements

- Notice (include maps and lists/tables)
  - Commission-designated operators within ½ mile
  - Surface owner
  - County Clerk
  - City Clerk (if within limits)
  - For commercial disposal wells, surface owners of all adjoining surface tracts
- Publication
  - Clipping
  - Affidavit

Disposal Well Application Elements

- Well Log (preferably annotated)
- Groundwater Depth Letter
- Area of Review
  - Map
  - Table of Wells

Disposal Well Application Elements

- Seismicity screen
  - See Statewide Rules 9(3)(B) & 46(b)(1)(C):
  - Historical USGS seismic events with M ≥ 2.0 within a circular area of 100 square miles (9.08 km).
- ***An earthquake event of 2.0 M or greater within the 9.08 km area of review (AOR) will trigger the seismic review***
  - RRC Staff will consider both USGS and TexNet catalogs in assessing the seismic trigger.

Elements of a Disposal Well Application

If seismicity screen is positive, supplemental information is required to assess the state of the disposal zone and adjacent strata:

- Structure map(s)
- Isopach map(s)
- Cross-sections
- Fault hazard analysis may be required.
- May also submit other relevant information to assist with scoring

Seismic Review

- **The purpose of the supplemental information is to enable staff to conduct the seismic review.**
- The seismic review is a scoring system that considers:
  - Faulting and Seismicity Factors (8)
  - Operational Factors (2)
  - Reservoir Factors (3)

Seismicity & Faulting Factors

Seismicity & Faulting Data Confidence

A: High

Site specific, high resolution, compelling, filed

B: Medium

Intermediate resolution, interpreted derivatives, suggesting a more favorable score is warranted

C: Low

Publicly available regional data with no new insights, information does not suggest adjustment is warranted

Seismicity & Faulting Factors (continued)

- Number of Mapped Faults in the Area of Review ("AOI", 9.08 km circle)
- Horizontal Distance To Nearest Mapped Fault
- Distance from Base of Disposal Zone to Basement or Top of Basement Fault
- Number of Seismic Events > 2.0 M in AOI
- Horizontal Distance to Seismic Event > 2.0M
- Maximum Seismic Event Magnitude in AOI
- Years Since Last Seismic Event in AOI

Operational Factors

- Combined Permitted Injection Rate within 2.8 mi
- Distance to Nearest Injection Well in Same Interval(s)

Reservoir Factors

- Disposal Zone Static Permeability
- Disposal Zone Cumulative Thickness
- Disposal Zone Lithology

Seismic Review

Recap: ***The purpose of the supplemental information is to enable staff to conduct the seismic review.***

Scoring

Factor Category Scores

The non-numerical center of distribution of factor scores in each category

Overall Score

The Non-numerical center of distribution of factor category scores, in which the seismicity and faulting factor category is weighted twice

Additional Information Required

For Category “B” Applications

Fault stress modeling (for example, Fault Slip Potential) may be required if evidence of faulting (mapped faults or seismic event clustering) is within 2.8 mi.

For Categort “C” Applications

Fault stress modeling is required if evidence of faulting is within the AOI.

Permit Conditions

Category A:

- 30,000 bpd max
- Daily Records (volume, max pressure)
- Initial Static Bottom-hole Pressure Test
- Step Rate Test

Permit Conditions

Category B:

- 20,000 bpd max
- Daily Records (volume, max pressure)
- Initial Static Bottom-hole Pressure Test
- Step Rate Test

Permit Conditions

Category C:

- 10,000 bpd max
- Daily Records (volume, max pressure)
- Initial Static Bottom-hole Pressure Test
- Step Rate Test
- Seismologist Review and Approval with Additional Conditions as Necessary

Mitigation Opportunities

Disposal wells scored as “B” or “C” may be authorized to inject an **additional 10,000 bpd**, provided:

- Operator actively implementing a **seismic monitoring plan** that augments the open public data network, and
- Operator develops and implements a **seismic event response plan** (submitted to RRC)

Seismic Monitoring Plan

- Implement a seismic monitoring plan that provides for the **contribution of data to an existing public seismic network** (e.g., TexNet).
- Monitoring to **contribute to the body of public knowledge** available to better resolve earthquake locations, especially depth.
- Include method of monitoring, type of instrumentation, reporting of data analysis, and an archive of the data in a public seismic database.

Seismic Monitoring Plan

- The minimal sensor and datalogger requirements for instrumentation are as follows.
  - Sensor:
    - 3 Component orthogonal axis
    - Response: 1Hz to 100Hz
  - Datalogger:
    - 24 bit digitizer
    - Sampling rate at least up to 200 sps
    - Integrated seedlink server
    - Timing using Global Positioning System (GPS).

Earthquake Response Plan

- Implement an earthquake response plan.
- Identify the actions that will be taken to inspect for damage, mitigate and/or manage risk by modifying operations, and establish thresholds for suspension of injection activity.
- Specific elements of the earthquake response plan should include:
  - Monitoring plan will be filed with the Commission before disposal activities begin.
  - Operator will monitor TexNet and USGS catalogs.

Earthquake Response Plan

- Specific elements of the earthquake response plan should include (continued):
  - Response plan triggered when a 3.5 M event is detected with a reported hypocenter location within the 9.08 km AOI.
  - Response plan will identify the actions the well operator will take when a 3.5 M event is detected with a reported hypocenter location within the 9.08 km AOI.
  - Operator will notify the Commission within 24 hours of an earthquake that triggers the response plan.
  - Within 30 days of an earthquake trigger, the operator will file a report with the Commission documenting the event.

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Guidelines – Going Forward

- Anticipate full guidelines implementation Summer 2019
- RRC Response Plan design began March 2019
- For General UIC Guidance: https://www.rrc.texas.gov/oil-gas/applications-and-permits/injection-permit-types-and-information/oil-and-gas-waste-disposal/