

131 FERC ¶ 61,209
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Jon Wellinghoff, Chairman;
Marc Spitzer, Philip D. Moeller,
and John R. Norris.

Northern Natural Gas Company

Docket No. CP09-465-000

ORDER ISSUING CERTIFICATE

(Issued June 2, 2010)

1. On September 14, 2009, Northern Natural Gas Company (Northern) filed an application pursuant to section 7 of the Natural Gas Act (NGA) for a certificate of public convenience and necessity to expand the certificated protective boundary, or buffer zone, around its Cunningham storage field in Kansas. For the reasons discussed below, the Commission will grant Northern a certificate authorizing a portion of the proposed expansion area.

I. Background

2. The Commission granted Northern certificate authorization in 1978 to develop and operate the Cunningham storage facility in Pratt and Kingman Counties, Kansas.¹ Currently, the Cunningham field and buffer zone covers approximately 28,000 acres. The facility stores gas in the Viola formation and the underlying Simpson formation. The storage facility has 81 wells, including 52 injection/withdrawal wells, 28 observation wells, and a water disposal well; pipelines interconnecting the wells; and compression facilities.

3. In 1978, when the Commission originally authorized Northern to develop the Cunningham field, the available information suggested the Viola formation was an isolated reservoir. In 1996, based on data showing the Viola formation was in

¹ The original 1978 certificate authorizing construction of the Cunningham Storage Field was granted in an unpublished letter order. *See Northern Natural Gas Company*, 77 FERC ¶ 61,069, at 61,297 (1996).

communication with the underlying Simpson formation, the Commission granted Northern certificate authority to also use the underlying Simpson formation as a component of the storage reservoir.² In 2005, Northern's gas sampling, pressure and flow testing, and seismic analysis showed that its storage gas was migrating away from the Cunningham field. Therefore, Northern proposed and the Commission approved the construction of two withdrawal wells and an additional compressor unit to prevent further migration of storage gas.³

4. In March 2007, Northern filed an application to expand the Cunningham field's buffer zone by 4,800 acres to address continued migration issues. In October 2008, the Commission authorized 1,760 acres of the requested expansion, which increased the certificated area of the storage field and buffer zone to approximately 28,000 acres.⁴ Northern sought rehearing of the October 2008 Order, which the Commission denied in April 2009.⁵

II. Description of Proposal

5. Northern requests authorization to extend the Cunningham field's protective boundary, or buffer zone, to include an additional 14,240 acres.⁶ Northern states that third-party operators in the proposed 14,240-acre extension area are producing Northern's storage gas and expansion of the buffer zone, along with Northern's implementation of a four-step management plan, will allow it to protect the integrity of the Cunningham storage field.⁷ If the Commission approves Northern's proposals,

² *Id.* at 61,298. *See also* Northern September 14, 2009 Application, Ex. Z at 2.

³ 112 FERC ¶ 61,291 (2005).

⁴ 125 FERC ¶ 61,127 (2008) (October 2008 Order).

⁵ 127 FERC ¶ 61,038 (2009).

⁶ The Cunningham storage field has two different boundaries: the reservoir boundary and the protective boundary. The reservoir boundary is where the storage gas is injected and stored. Beyond the reservoir boundary, the Cunningham storage field has a protective boundary. The protective boundary is designed to protect the storage field from gas losses due to migration. The area located between the reservoir boundary and protective boundary is the buffer zone. When determining the capacity of a storage field, the Commission only looks to storage capacity available within the reservoir boundary. Northern proposes no changes to the active storage reservoir or to the current certificated capacity of the storage facility.

⁷ Northern September 14, 2009 Application, Ex. Z at 35-36.

Northern states that, in the first step of the management plan, it will shut down all production from currently producing third-party wells, as well as from Northern's two recycle wells approved in 2005 that lie north of the northern faults. Northern claims that this step will stop third-party removal of both water and storage gas from the reservoir, which has created a pressure sink causing the migration of storage gas. In the second step, Northern will monitor pressures in the buffer zone and determine whether pressures return to pre-1995 levels, which is when the migration of gas began. If pressures return to pre-1995 levels, Northern will continue to monitor the pressures. However, if pressures do not return to pre-1995 levels, in the third step Northern will request authorization from the Commission and the Kansas Corporation Commission (KCC) to implement a water injection program to assist in re-pressurizing the buffer zone area. Finally, in the fourth and final step, Northern will convert certain shut-in wells into production wells or construct additional wells to off-set any potential wells that third-party producers may complete outside the boundaries of the buffer zone.

III. Notice, Interventions, and Protests

6. The Commission published notice of Northern's application in the *Federal Register* on September 29, 2009.⁸ Timely, unopposed motions to intervene were filed by MidAmerican Energy Company; Val Energy, Inc. (Val Energy); Nash Oil & Gas, Inc. (Nash); L. D. Drilling, Inc. (L. D. Drilling);⁹ Minnesota Energy Resources Corporation; Pratt County, Kansas (County), the Haynesville Surface and Mineral Owners Association, Inc. (Association); Sabco Oil and Gas Corporation (Sabco); SEMCO Energy Gas Company; Atmos Energy Corporation; and Lou C. Miller, as trustee for the Johnathan Bryce Miller and Barbara Lou Miller Trust. The KCC filed a notice of intervention. This notice of intervention and the timely, unopposed motions to intervene serve to make the entities that filed them parties to this proceeding by operation of Rule 214 of the Commission's Rules of Practice and Procedure.¹⁰

7. Black Hills Utility Holdings, Inc. d/b/a Black Hills Energy (Black Hills), Northern States Power Company-Minnesota (NSP-Minnesota), Northern States Power Company-Wisconsin (NSP-Wisconsin) and Southwestern Public Service Company (SPS) (NSP-Minnesota, NSP-Wisconsin and SPS are referred to herein jointly as the Excel Energy Companies) filed untimely motions to intervene. The motions of Black Hills and the Excel Energy Companies show that the late intervenors have a direct and substantial

⁸ 74 Fed. Reg. 49,871 (2009).

⁹ Val Energy, Nash, and L. D. Drilling are referred to herein jointly as the Nash Group.

¹⁰ 18 C.F.R. § 385.214(c) (2009).

interest in this proceeding, and that granting the motions will not delay the proceeding or cause undue prejudice to the other parties. For good cause shown, the motions will be granted.¹¹

8. Many of the intervenors, such as the County, the Association, Nash, Val Energy, and L. D. Drilling filed timely comments, protests, or both. Kevin Schwertfeger and Dorothy Trinkle, and Lou C. Miller, as trustee for the Johnathan Bryce Miller and Barbara Lou Miller Trust, filed comments. The County, the Association, and Sabco also filed untimely protests. Northern filed answers to these protests on October 28, 2009, and December 9, 2009.¹²

9. On February 3, 2010, Northern filed a motion requesting approval of its application, which prompted additional filings by the Nash Group, the County and the Association (jointly), Sabco, and KCC, followed by a reply by Northern.

IV. Preliminary Matters

A. Holding This Proceeding In Abeyance

10. The Nash Group suggests the Commission should consider a stay of the proceedings because Northern has initiated court litigation on the same factual issues that are presently before the Commission.¹³ Northern argues against this stay request, stating that the issues in the pending court litigation involve damages for conversion, unjust enrichment, and nuisance; and a request for injunctive relief, which are different from the issues in these present proceedings involving a determination of the public convenience and necessity.¹⁴

11. Since there is no final order to stay, the Commission will treat the Nash Group's request as a request to hold these proceedings in abeyance.¹⁵ The Commission finds that

¹¹ See 18 C.F.R. § 385.214(d) (2009).

¹² Although the Commission's Rules of Practice and Procedure do not permit answers to protests, the Commission finds good cause to waive Rule 213 to admit Northern's pleadings, as they have provided the Commission with information that has assisted us in our decision making process. 18 C.F.R. § 385.213(a)(2) (2009).

¹³ Nash Group October 13, 2009 Protest at 10-12.

¹⁴ Northern October 28, 2009 Answer at 2-3.

¹⁵ See *City of Klamath Falls*, 69 FERC ¶ 61,188, at 61,781 (1994) ("A stay delays the effectiveness of an order issued by the Commission. Since we have not taken any
(continued...)

nothing in this record supports a finding that the public interest would be served by ordering these proceedings held in abeyance. While the Nash Group may be correct that some of the same facts are involved in the court proceedings and here, the ultimate issues in the court proceedings—damages for conversion, unjust enrichment, nuisance, injunctive relief—are different from the issue before the Commission, i.e. whether expanding the protective boundary of the storage field is in the public convenience and necessity.¹⁶ Thus, the Commission declines to hold these proceedings in abeyance.

B. Request for Evidentiary Hearing and Technical Conference

12. In their protests, Sabco, the County, and the Association request an evidentiary hearing or, in the alternative, a technical conference.¹⁷ Sabco believes that an opportunity should be provided for Northern and interested parties to bring their respective experts to the Commission, either to present their views and stand for cross-examination at a trial-type hearing, or to meet with each other and Commission staff in a technical conference. The County and Association request a hearing on the grounds that there are disputed issues of fact concerning the extent of any alleged gas migration into the proposed expanded buffer zone. In response, Northern contends that the paper hearing used by the Commission in these proceedings is adequate for resolving any disputed factual issues.¹⁸ Northern asserts that the Commission routinely decides complex and controversial cases on the basis of the record in a paper hearing, pointing out the Commission declined to order an evidentiary hearing in the October 2008 Order. As for the claim by the County and Association that they should have the right to offer evidence, Northern points out that the County and Association retain this right through the paper hearing process, yet they have failed to avail themselves of the right by offering any evidence.

13. The Commission finds that the record, including the application, responses to data requests, and the other pleadings, contains sufficient information to make a reasoned decision on the merits in this proceeding. Thus, no purpose would be served by convening a technical conference.

action with regard to the application in question, there is no order to be stayed. Instead, the appropriate relief here is an order holding the proceeding in abeyance.”).

¹⁶ See October 2008 Order, 125 FERC ¶ 61,127 at P 12.

¹⁷ County and Association October 13, 2009 Protest at 22; Sabco November 24, 2009 Protest at 12-13.

¹⁸ Northern October 28, 2009 Answer at 4-5.

14. Section 7 of the NGA provides for a hearing when an applicant seeks a certificate of public convenience and necessity but does not require that all such hearings be formal trial-type hearings. An evidentiary trial-type hearing is necessary only where material issues of fact are in dispute that cannot be resolved on the basis of the written record.¹⁹ As discussed below, the written record provides a sufficient basis upon which to resolve the factual issues presented in this case. Consequently, the Commission finds no need for an evidentiary hearing.

V. Discussion

15. Because Northern seeks certificate authority to enlarge its Cunningham facility used for the storage of natural gas in interstate commerce subject to the jurisdiction of the Commission, the proposal is subject to the requirements of subsections (c) and (e) of section 7 of the NGA.

A. Certificate Policy Statement

16. The Certificate Policy Statement established criteria for determining whether there is a need for a proposed project and whether the proposed project will serve the public interest.²⁰ The Certificate Policy Statement explains that in deciding whether to authorize the expansion of natural gas facilities, the Commission balances the public benefits against the potential adverse consequences. The Commission's goal is to give appropriate consideration to the enhancement of competitive transportation alternatives, the possibility of overbuilding, subsidization by existing customers, the applicant's responsibility for unsubscribed capacity, the avoidance of unnecessary disruptions of the environment, and the unneeded exercise of eminent domain.

17. Under this policy, the threshold requirement for pipelines proposing new projects is that the pipeline must be prepared to financially support the project without relying on subsidization from its existing customers. The next step is to determine whether the applicant has made efforts to eliminate or minimize any adverse effects the project might have on the applicant's existing customers, existing pipelines in the market and their captive customers, or landowners and communities affected by the route of the new pipeline. If residual adverse effects on these interest groups are identified after efforts

¹⁹ See, e.g., *Southern Union Gas Co. v. FERC*, 840 F.2d 964, 970 (D.C. Cir. 1988); *Cerro Wire & Cable Co. v. FERC*, 677 F.2d 124 (D.C. Cir. 1982); and *Citizens for Allegan County, Inc. v. FPC*, 414 F.2d 1125, 1128 (D.C. Cir. 1969).

²⁰ *Certification of New Interstate Natural Gas Pipeline Facilities*, 88 FERC ¶ 61,227, at 61,748 (1999); *order on clarification*, 90 FERC ¶ 61,128 (2000); and *order on clarification*, 92 FERC ¶ 61,094 (2000) (Certificate Policy Statement).

have been made to minimize them, the Commission will evaluate the project by balancing the evidence of public benefits to be achieved against the residual adverse effects. This is essentially an economic test. Only when the benefits outweigh the adverse effects on economic interests will the Commission proceed to complete the environmental analysis where other interests are considered.

18. As stated, the threshold requirement is that the applicant must be prepared to financially support the project without relying on subsidization from its existing customers. However, the Certificate Policy Statement also provides that existing customers should pay for the costs of projects designed to improve their service, such as projects to replace existing capacity, improve reliability, or provide additional flexibility. Under the Certificate Policy Statement, increasing the rates of existing customers to pay for these types of improvements does not constitute a subsidy, and the costs of such projects are permitted to be rolled into system-wide rates.²¹ As discussed below, authorizing the expansion of the Cunningham storage field's certificated boundary, along with the conditions set forth in this order, will enable Northern to protect the security and integrity of the storage field and will improve service for Northern's existing customers by increasing the reliability of its storage services. The proposed project is necessary, in part, to ensure the integrity of the Cunningham storage field and reliability of storage service to the benefit of all Northern customers. Thus, the Commission concludes that it is appropriate to permit Northern to roll in the reasonable project costs as part of its storage function cost of service in its next NGA section 4 rate proceeding, absent a significant change in circumstances. The Commission finds that the threshold requirement of the Certificate Policy Statement is satisfied.

19. The Commission finds that limited expansion of the Cunningham field buffer zone will not affect the certificated operational parameters of the storage field, nor will it degrade any existing service provided by Northern. Further, Northern's proposal will have no adverse impact on other pipelines or their customers.

20. The intervening parties have raised issues regarding the impact of Northern's proposal to extend the Cunningham field boundaries on surrounding landowners and communities. Kevin Schwertfeger filed comments in opposition to Northern's proposed expansion stating that the proposal is an intrusion on property rights. Dorothy Trinkle filed comments stating that the acreage Northern seeks to acquire is an active production field with over 30 producing wells and urges the Commission to insist Northern cease any further attempts to obtain rights to the productive field. Trustee Lou C. Miller argues that the Commission should exclude the trust's property from the expanded buffer zone because doing so would permit the trust to continue extracting naturally occurring gas

²¹ Certificate Policy Statement, 88 FERC ¶ 61,227 at 61,747, n.12 (1999).

which is located under the Miller property. In response to the arguments of Dorothy Trinkle, Trustee Lou C. Miller, and Kevin Schwertfeger, Northern cites *Columbia Gas Transmission Corp.*,²² and contends that landowners' interests in the production of storage gas is not an interest that the Commission seeks to protect when balancing the public interest.²³

21. The Commission addresses the technical arguments raised below, but notes here that the issues raised by surrounding landowners regarding potential impacts of Northern's proposed expansion of the Cunningham field concern economic impacts to their mineral rights for which they will be compensated, either through negotiation with Northern of storage leases or easements or through the eminent domain process in state or federal court.²⁴ Through the eminent domain process, the value of any native gas will be taken into account by a court in deciding the appropriate value of each individual landowner's mineral and property rights.

22. Under the Certificate Policy Statement, the Commission will not issue a certificate of public convenience and necessity authorizing a project, with the concomitant right to obtain the necessary property rights through either negotiation or the eminent domain process, unless the Commission finds that the project benefits the public and is in the public interest, and that the overall public, not private, benefits of the project outweigh the potential adverse impacts. The Commission has recognized that underground natural gas storage fields are an essential part of the natural gas infrastructure. Natural gas storage is critical in ensuring that overall demands and specific requirements of natural gas customers are met.

²² 128 FERC ¶ 61,050 at P 31, n. 36 and P 48, n. 55 (2009) (“[T]he degree of economic impact on individual landowners is relevant only to the amount Columbia should be required to compensate affected landowners, which will be considered and resolved in eminent domain proceedings before a state or federal court and not in this proceeding.”).

²³ Northern October 28, 2009 Answer at 17.

²⁴ Under section 7(h) of the NGA, a certificate of public convenience or necessity confers on the certificate holder the right to acquire property rights by exercising the right of eminent domain in a court action if the certificate holder cannot acquire the property rights by contract or is unable to agree with the property owner on the amount of compensation. It is incumbent upon the applicant to make good faith efforts to negotiate with landowners for any needed rights. However, if the parties cannot reach agreement, issues of compensation for land taken by a pipeline under the eminent domain provisions of the NGA are matters for state or federal court.

23. Northern's firm storage customers are principally local distribution companies that use Northern's storage services to satisfy the heating needs of their customers in the upper Midwest.²⁵ These customers inject natural gas into storage during warm months, when demand (and prices) are historically low, and withdraw the stored gas during the cold months, to meet the heating needs of their customers. Northern has a responsibility to protect the natural gas that its customers have entrusted to Northern to store for them in the Cunningham field and, to that end, has a responsibility to maintain the integrity of the storage reservoir. Northern is obligated to protect the integrity of the storage field, which benefits the customers of the local distribution companies storing gas in the Cunningham field.

24. The Commission has balanced the interests of surrounding land and mineral rights owners against the public benefits of a secure Cunningham storage field, and finds that the potential adverse economic impacts to the interests of the property rights owners are outweighed by the substantial public benefits associated with the need for Northern to protect the integrity of its storage field. Accordingly, in view of the above considerations, and as further supported below, the Commission finds that, consistent with the Certificate Policy Statement and section 7 of the NGA, approval of the limited expansion of the Cunningham storage field's buffer zone is in the public convenience and necessity.²⁶

B. Technical Analysis

25. There is inherent uncertainty regarding the performance of an underground reservoir. Its actual boundaries depend on characteristics that can generally be confirmed only after the facility has commenced operation. Thus, it is not unusual to find that when a storage facility commences operation, the initially designated boundaries of the underground reservoir do not confine gas volumes as anticipated. In such cases, to ensure the integrity of the storage reservoir and the efficient operation of the storage facility, the Commission typically either revises a storage facility's certificated boundaries to conform to the enlarged contours of the actual underground reservoir²⁷ or

²⁵ Northern December 9, 2009 Answer at 11.

²⁶ Certificate Policy Statement, 88 FERC ¶ 61,227 (1999); *Southern Star Central Gas Pipeline, Inc.*, 115 FERC ¶ 61,219 (2006).

²⁷ See, e.g., *Williston Basin Interstate Pipeline Co.*, 127 FERC ¶ 61,045 (2009); *Dominion Transmission, Inc.*, 100 FERC ¶ 61,168 (2002); *Williams Natural Gas Co.*, 83 FERC ¶ 61,120 (1998); *Williams Natural Gas Co.*, 77 FERC ¶ 61,150 (1996); *ANR Pipeline Co.*, 76 FERC ¶ 61,263 (1996), *reh'g denied*, 78 FERC ¶ 61,122 (1997); and *Columbia Gas Transmission Corp.*, 35 FERC ¶ 61,345 (1986).

alters the operating parameters of the storage facility to prevent gas from migrating beyond the facility's certificated boundaries.²⁸

26. The Commission grants jurisdictional storage field operators additional certificate authority to revise the boundary of storage fields when the applicant can demonstrate, with engineering and geological data, that such authorization is required by the public convenience and necessity in order to improve the operation of the storage field or to maintain its integrity.²⁹ In deciding whether the public convenience and necessity requires approval of a company's request to enlarge its storage boundary due to gas migration problems, a material consideration is whether the storage reservoir has expanded and whether the company's estimations of the reservoir and protective boundaries are reasonable.³⁰

27. The record in this proceeding contains Northern's application, including the geological, geophysical, geochemical, and engineering data in Exhibit Z; comments and pleadings from various landowners; and the data responses of Northern and others to staff's data requests seeking additional information to supplement the record. The pleadings in this proceeding demonstrate the following: (1) storage gas migrates from the storage reservoir through a non-sealing fault in a northerly direction in the Viola formation through much of the proposed buffer zone expansion; (2) the Viola formation is continuous and likely extends beyond the proposed expanded buffer zone; (3) there are no geologic features (i.e., faults, pinchouts, unconformities, etc.) that would prevent gas from migrating through and beyond the expanded buffer zone; (4) geochemical analysis of gas from wells in the central portion of the expanded buffer zone within the primary gas migration pathway contain chemical concentrations consistent with that of storage gas; (5) a mix of storage gas and native gas exists in wells located in the north central portion of the expanded buffer zone, with higher concentrations of native gas in the most northerly located wells; and (6) native gas and other hydrocarbon resources are present in or near structural highs in varying or indeterminable concentrations within the currently

²⁸ See, e.g., *Equitrans, L.P.*, 119 FERC ¶ 61,287 (2007), in which the Commission set maximum inventory and pressure parameters at levels to ensure the integrity of storage reservoirs and minimize gas migration.

²⁹ See *Williams Natural Gas Co.*, 83 FERC ¶ 61,120 (1998); *Williams Natural Gas Co.*, 77 FERC ¶ 61,150 (1996); *ANR Pipeline Co.*, 76 FERC ¶ 61,263 (1996), *reh'g denied*, 78 FERC ¶ 61,122 (1997); and *Columbia Gas Transmission Corp.*, 35 FERC ¶ 61,345 (1986).

³⁰ *ANR Pipeline Co.*, 76 FERC ¶ 61,263, at 62,346 (1996).

certificated boundary, within the proposed expanded buffer zone, and outside of these two areas.

28. Based upon these findings, the Commission will authorize the expansion of the Cunningham field's certificated boundary. The Commission finds, however, that the proposed extent of Northern's protective boundary expansion is not reasonable. Based on the findings below, the Commission will authorize only 12,320 acres for expansion, rather than Northern's proposed 14,240 acres. The acreage not authorized will be referred to herein as "section 28"³¹ in Pratt County. Finally, the Commission will require Northern to design and implement a plan that will prevent the migration of storage gas beyond the newly authorized boundary and will require quarterly reporting on all actions taken, including an assessment of the results of Northern's actions on halting the migration of storage gas. The issues raised by Northern's application and the other pleadings are discussed below.

1. Expansion of the Storage Reservoir: Evidence of Gas Migration

a. Storage Field Geology

29. The Commission determined in the October 2008 Order that storage gas migrates from the storage reservoir through a non-sealing fault to the north.³² The Commission will not revisit the technicalities of that determination; however, a basic discussion of the mechanics of migration follows below. In addition to the evidence relied upon by the Commission in the October 2008 Order, the Commission notes that Northern presented in these proceedings additional geologic and geochemical data demonstrating that storage gas migrates unimpeded to the north through a primary gas migration pathway.³³

³¹ For purposes of discussion in this order, "section 28" includes an area in the northwest part of Northern's proposed expanded buffer zone consisting of the following sections within T26S, R11W: SE 1/4 S20, S 1/2 S21, E 1/2 S29, S28, NE 1/4 S32, and N 1/2 S33.

³² The October 2008 Order determined that storage gas could migrate through a pathway located where the Simpson formation in the storage reservoir on the upthrow side of the fault would be in contact with the downthrow Viola formation outside the storage reservoir, thus creating a Simpson-to-Viola pathway.

³³ Based upon geochemical analysis, the primary gas migration pathway in the extension area includes the following sections in Pratt County: T27S, R11W sections 1, 2, 11, and 12; T26S, R11W sections 23, 24, 25, 26, 35, and 36.

30. The Cunningham field comprises portions of the Viola and Simpson formations operating as one reservoir, which is bounded by two faults. The Cunningham field was depleted by gas production prior to 1977. An aquifer, which served as a hydrostatic seal for the reservoir, extends north of the northern fault. During gas production, the aquifer acted as a limited water drive for the gas reservoir, pushing the gas out of the pore spaces within the reservoir and allowing water to fill up the previously gas-filled pore spaces. Northern presented data indicating that as gas was produced from the field, the pressure of the aquifer north of the fault decreased.

31. As storage gas filled the depleted Cunningham reservoir, the gas searched out a path of least resistance (i.e., through porous, permeable rock at lower pressure), moving north beyond the original gas-water contact, past the northern fault, and into the aquifer. Northern presented data indicating that the pressure in the aquifer north of the field increased during the fill-up stage of the Cunningham storage reservoir. Hysteresis curves³⁴ indicate that the field stabilized in 1985 and remained stable for approximately ten years at which time a new gas-water contact formed north of the fault.

32. Around 1994, the hysteresis curves began to indicate gas loss from the Cunningham reservoir, which Northern attributes to third-party production that began about that time from wells located approximately five miles nearly due north of the non-sealing fault. These third-party producers were the operators of the Nash wells discussed in the October 2008 Order.³⁵ Here, Northern presented additional data indicating that the number of production wells in the proposed expanded buffer zone is increasing and that the wells remove large, but unquantified volumes of water to achieve low wellbore pressures.³⁶ The low wellbore pressures help to create a pressure sink, where gas can more easily be produced as it seeks equilibrium by migrating from higher to lower pressures. Northern also presented data indicating that production from many of the wells in the proposed expansion area exhibit cyclical production that correlates with storage operations. Northern's data indicates that, to date, approximately 13 Bcf of gas has migrated from the storage field.

³⁴ A hysteresis curve is a graphical depiction of gas inventory versus pressure that can be used to track storage field stability and/or gas losses over time.

³⁵ Nash owns seven wells within the proposed expanded buffer zone that are located approximately one and a half to three miles south of the northern boundary of the proposed buffer zone expansion.

³⁶ Reports filed by third-party operators with the KCC indicate that approximately 0.5 barrels of water were produced with each Mcf of gas in 2008.

33. To further support its assertion in these proceedings that storage gas can migrate freely into the proposed buffer zone expansion, Northern reviewed the historical evidence related to the reservoir characteristics and gas migration associated with the Cunningham field, including information from wells owned by Northern and third-party operators and seismic data in the boundary area certificated by the October 2008 Order and within the proposed expansion area where Northern has already obtained leasehold rights. Northern built on this data by integrating newly-acquired 3-D seismic data which, when merged with the existing seismic data, support Northern's position that the Viola formation is continuous from the northern Cunningham field fault with no evidence of faults or structures that would hinder the migration of storage gas into or beyond the proposed expanded buffer zone. Northern also used both existing and newly acquired data to generate Viola structure and isopach maps³⁷ that it avers demonstrate a continuous, unfaulted Viola reservoir throughout the proposed expansion area. Core data obtained by Northern in the recently completed Guthrie 1-31 well demonstrate the presence of a permeable and porous upper Viola formation within most of the proposed expanded buffer zone.³⁸ Based upon this geological and geophysical data presented by Northern, the Commission finds there are no geologic faults or barriers that would impede storage gas migration to the north into and beyond the proposed expanded buffer zone.

34. The Commission also analyzed the geologic regime in and around the Cunningham field. Examination of Northern's Exhibit 12 indicates that the Viola formation, in which structural highs and lows exist, rises to the north. Within the currently certificated protective boundary, a structural low located just north of the non-sealing fault is bordered by structural highs located approximately one mile northwest of where the Park wells³⁹ are located, with another high approximately two miles northeast

³⁷ An isopach map is a map containing contour lines depicting locations of equal stratigraphic thickness of a given formation over an area.

³⁸ However, another newly installed well, Henrichs 10-21, which is located in the southwestern portion of the proposed expansion area, and outside the primary gas migration pathway, did not encounter the upper portion of the Viola formation. Additionally, Exhibit 10 shows the Trinkle 1-28 well, which is also outside the primary gas migration pathway and inside section 28, exhibited zero percent porosity in the two-foot perforated zone. Accordingly, the Commission disagrees with Northern that the highly porous upper portion of the Viola formation exists throughout the entire portion of Northern's proposed expansion area. *See* Northern September 14, 2009 Application, Ex. Z at 10.

³⁹ The two Park wells are located just north of the certificated Cunningham storage field protective boundary that existed prior to the buffer zone expansion resulting from the October 2008 Order. The Commission's staff analyzed the Park wells in the October

(continued...)

of the structural low. Another structural high is located in the extreme northeastern portion of the currently-certificated protective boundary, and it is on this high that well 16-32 is located.

35. While the geochemical analysis of Northern's data follows below, it is important to note that the two Park wells and well 16-32, located on structural highs, either now contain some concentration of native gas or contained native gas at one time. As the October 2008 Order determined, geochemical trend analysis of gas from the Park wells found that storage gas replaced native gas over time, a transition Northern acknowledges.⁴⁰ Northern further acknowledges native gas presence in well 16-32.⁴¹

36. The structural low located just north of the non-sealing fault extends northward beyond the certificated boundary and into the southern portion of the proposed expansion area for approximately 1.5 miles as the Viola formation begins to rise to the north. Structural highs are located to the east and west of the structural low "valley" framed by the highs. Northern completed and sampled gas from two observation wells in August 2009. One of those wells, the Guthrie 1-31 well, was located between the two highs, and the other one, the Henrichs 10-21 well, was located on the western high. Gas samples from these wells shows gas from the Guthrie 1-31 well was storage gas and gas from the Henrichs 10-21 well was native gas.⁴² This data is consistent with the finding that Northern's storage gas is migrating through areas characterized by structural lows.

37. Exhibit 12 shows that the Viola formation continues rising in the northern portion of the proposed expansion area where two structural highs approximately one mile apart frame the north central portion of the expansion area. An additional structural high is located in section 28 in the northwest portion of the expansion area, suggesting that native gas may accumulate there. Thus, the Viola formation, north of the non-sealing fault and in the proposed expanded buffer zone, is characterized as rising to the north in a

2008 Order and determined that the Park wells were primarily producing storage gas. October 2008 Order, 125 FERC ¶ 61,127 at P 22.

⁴⁰ In its application, Northern states: "The transition over time from native Viola gas to storage gas was clearly evident in the Trans Pacific samples taken in 1988, 1998, and 2007." Northern September 14, 2009 Application, Ex. Z, Appendix B at 11.

⁴¹ In its application, Northern states: "The presence of native gas remnants at low bottom home pressures (280 psi) was observed in a 2006 gas sample from observation well 16-32 near the Cunningham Field major fault to the northeast." *Id.* at 8.

⁴² Northern September 14, 2009 Application, Exhibits B-10 and B-11.

structural valley framed by a series of structural highs located near the eastern and western boundaries of the expansion area, with another high located in section 28.⁴³

38. Northern's data demonstrates that over time native gas in wells located north of the northern fault can be replaced with storage gas as a result of gas migration enhanced by gas production. Northern's data shows that native gas is present, or was at one time present, on several structural highs within Northern's certificated boundary and in and outside of the proposed expansion area. Exhibits B-8 and B-9 show that the Park 1A and Park 1 wells, located approximately 2.5 miles north of well 35-11,⁴⁴ contained helium and methane concentrations demonstrating a mix of storage gas and native gas in 1988, but that by 1998 became increasingly more consistent with storage gas. The relevant concentrations analyzed in 2007 from the Park 1A and Park 1 wells are definitively identified as storage gas. Northern acknowledges the transition over time from native Viola gas to storage gas in the Park wells. This being the case, the presence of native gas is confirmed in a structural high within the certificated boundary, less than two miles north of the non-sealing fault.

39. Exhibit 12 also depicts over seventy oil wells located approximately one to four miles west and northwest of the structural low located in the extreme northwest corner of the proposed expansion area,⁴⁵ and in the Viola formation that rises upward to the northwest to a structural high. Additionally, five gas wells and two oil and gas wells have been completed in this oil producing region.

40. A gas well, Swisher B-1, is located approximately 1.5 miles west of the certificated boundary, approximately midway between structurally high and low areas. Another gas well is located nearly adjacent to the Swisher B-1 well. Two other gas wells are located approximately one mile northwest of the Swisher B-1 well and approaching a structural high.⁴⁶ Exhibit 12 also shows an oil and gas producing area on a structural high located approximately five miles west of the Cunningham reservoir fault and approximately two miles west of the Swisher B-1 well, with five oil wells and two gas

⁴³ Northern presented geochemical analysis for wells located predominately in the central and north central portion of the expansion area.

⁴⁴ Well 35-11, located adjacent and north of the northern fault, likewise contained significant concentrations of native gas that has since transitioned to storage gas. *See* Exhibit B-3 and Exhibit 65.

⁴⁵ SE 1/4 Section 20 T26SR11W.

⁴⁶ Gas compositional data from Table B-1 indicates gas from the Swisher B-1 well is native gas.

wells. Northern presented data indicating that one well, Fincham 3, contained chemical concentrations consistent with native gas.⁴⁷ The presence of these hydrocarbon wells is consistent with the finding that there are hydrocarbon resources surrounding the originally certificated field.

41. Another oil producing area with eight oil wells is on a structural high less than a mile east of well 16-32 near the northeast corner of the certificated boundary. Finally, Exhibit 12 shows two oil wells on a structural high approximately one mile north of the Cunningham reservoir fault in the southwest portion of the certificated boundary. Again, the presence of these oil wells is consistent with the finding that there are native hydrocarbons surrounding and within the originally certificated field.

42. Exhibit 12 indicates that where oil and gas wells are present in and around Cunningham's existing certificated boundary and proposed expanded buffer zone, the producing wells are usually associated with structural highs. Analysis of gas compositional data as discussed below also shows that some wells containing either pure or variable concentrations of native gas are associated with structurally high areas. Accordingly, the Commission finds that native gas and other hydrocarbon resources are present in or near structural highs in the Viola formation.

b. Gas Compositional Analysis

43. Typically, natural gas that is native to gas producing formations, including crude oil production formations with associated gas, has a different chemical composition when compared to stored natural gas. For example, storage gas might have a higher methane content and contain predictable minor amounts of other gases because storage gas comprises variously sourced native gases that have been processed into marketable, pipeline quality gas.⁴⁸

44. Helium is a key tracer element that occurs naturally in native gas in the vicinity of the Cunningham field. During World War II, helium was produced in and around the Cunningham field; thus, helium concentrations in native gas would typically be higher than helium concentrations found in storage gas, which has relatively low helium concentrations. Over time, if a well that once produced native gas began producing migrated storage gas, the helium concentrations would logically be expected to decrease.

45. Northern provided gas compositional data from historical KCC data bases, as well as from its internal sampling program. To supplement that data, the Commission issued a

⁴⁷ Table B-1.

⁴⁸ *Southern Star Central Gas Pipeline, Inc.*, 123 FERC ¶ 61,123 (2008).

data request on October 26, 2009, seeking compositional analysis from certain Northern wells, as well as from wells under the control of third-party producers.⁴⁹ Nash provided access to Northern to allow sampling and analysis of its wells. However, in a November 25, 2009 filing, L. D. Drilling and Val Energy stated that they would not allow testing of their wells. Northern responded to staff's October 26, 2009 data request on December 8, 2009, with the results of the requested testing, including the Nash wells, the Schwertfeger well, and other wells under Northern's control.

46. In its proposal, and in its data response, Northern presented data indicating storage gas is present in the proposed expansion area in the primary migration pathway, and variable concentrations of native gas are also present within the pathway, as well as in and around the existing and proposed boundaries. First, Northern determined that the helium concentrations ranged from 0.64 percent to 1.22 percent in native gas. However, observation well 16-32, located east of the confining fault and in the northeast portion of the Cunningham field contained a helium concentration of 0.56 percent from a gas sample collected and analyzed in 2006.⁵⁰ Thus, staff analysis confirms that helium concentrations of native gas range from 0.56 percent to 1.22 percent in and around the Cunningham storage field. Northern further states that methane concentrations in native gas are typically below 80 percent.

47. Northern also provided data demonstrating that storage gas has a low helium content ranging from 0.028 percent to 0.156 percent (average of 0.1 percent) and a higher methane content ranging from 84.15 percent to 94.01 percent.⁵¹ Based on the available data, since the upper limit of helium in storage gas is 0.156 percent and the lower limit of

⁴⁹ The Commission requested sampling from the following wells in control of Nash, Val Energy, and L. D. Drilling: CRC-1, CRC-2, Trinkle-1, Staab-1, Geesling-1, Young 1-26, Holland 1-26, Zink-1, Zink A, Zink B, Mezger-1, Riffey V1, Koenemann 1, Trinkle 1, Trinkle 1-28, Trinkle 1-33. The Commission also requested testing of the independently owned Schwertfeger well and it was tested. *See* Commission staff's October 26, 2009 Data Request. Northern indicated that it had worked out an arrangement with Nash to test the CRC-1, CRC-2, Trinkle-1, Staab-1, Young 1-26, and Holland 1-26 wells; however, Nash's Young 1-26 well was not tested. The Val Energy and L. D. Drilling wells were not tested in response to the Commission staff's data request. *See* Northern November 13, 2009 Letter.

⁵⁰ Northern states that "remnant" native gas from well 16-32 exhibited a low bottomhole pressure of 280 psi.

⁵¹ Northern states that native Viola gas has methane concentrations consistently lower than 80 percent.

helium in native gas is 0.56 percent, helium concentrations in gas falling between these two concentrations is likely a blend of native and storage gas, demonstrating past native gas presence.

48. Tables B-1, B-2, and B-3 of Exhibit Z to Northern's application present concentrations of gas samples analyzed for various parameters including helium. Evaluation of the data reveals that observation well 8-41, located in the extreme southwestern part of the storage field contains methane and helium concentrations consistent with a mix of native gas and storage gas. In addition, helium concentrations similar to that of native gas were detected in well 35-11, which is located north of and nearly adjacent to the non-sealing fault. Further, the Maas #1 well, located west of the southwest corner of the proposed expansion area, contains native gas. Another well, Pollack #1, located near the Maas #1 well, also exhibited native gas concentrations.⁵² Yet another well located approximately 1.5 miles west of the storage field, Swisher B-1, exhibited native gas concentrations as recently as 1995. Finally, the Henrichs 10-21 well, located in the southwest portion of the proposed expansion area, appears to contain native gas, based on the available gas compositional data.⁵³

49. Thus, the data suggests native gas is present in varying concentrations in the western portion of the storage field, within the northeast portion of the certificated protective boundary area, within the certificated protective boundary area nearly adjacent to the non-sealing fault, as well as west of the storage field.⁵⁴

50. Northern also presented geochemical gas analysis in Table B-3 and, in response to the October 26, 2009 data request, additional analysis from wells in the proposed expansion area. All of the expansion area wells which were analyzed for chemical composition, with the exception of the Henrichs 10-21 and Vernon 1 wells, lie within the two-mile wide primary gas migration pathway.⁵⁵ As a result, the Commission is

⁵² Exhibit B-1 identifies Maas #1 and Pollack #1 as native gas wells.

⁵³ Native gas is also present in well 16-32 located approximately one mile northeast of the fault-bounded storage field in the northeast portion of the certificated boundary area. Additionally, the helium concentration of 1.31 percent from the Henrichs 10-21 well was higher than helium concentration in gas from the 23 wells Northern provided native gas analysis for in Table B-1.

⁵⁴ The Commission notes that the Park wells, the 16-32 well, and the Henrichs 10-21 well are located on structurally high areas, which is further support for the finding that native gas is present.

⁵⁵ The Henrichs 10-21 well lies approximately 0.4 mile west of the two mile-wide pathway and the Vernon 1 well lies approximately 0.1 mile west of the pathway.

confident a primary gas migration pathway exists which is providing an opportunity for Northern's storage gas to migrate outside the presently certificated boundaries.

51. As previously noted, the Guthrie 1-31 well, located approximately 1.5 miles north of the certificated boundary and slightly higher from a structural low, contains gas with a chemical composition consistent with storage gas. The Henrichs 10-21 well, located approximately 0.7 miles north of the certificated boundary near a structural high, contained gas with a composition consistent with native gas.

52. The CRC 1 and CRC 2 wells lie approximately 0.5 mile northwest of the Guthrie 1-31 well and outside the certificated boundary. Northern presented chemical composition data demonstrating that these wells contain storage gas. The Trinkle 1 and Staab 1 wells, for which analysis of chemical composition also indicates storage gas, are approximately 0.5 mile north of the CRC wells and further from the certificated boundary.

53. The Riffey V1-25 well, located in the primary gas migration pathway less than one mile northeast of Trinkle 1 well, contained storage gas. Eleven wells in the northernmost two-mile portion of the proposed expansion area contained gas that was primarily storage gas, but exhibited chemical compositions consistent with the presence of some native gas as well.

54. In its application, Northern determined the relative percentage of storage gas in any sampled gas well by developing a mixing curve between the two opposite end-member gases (storage and native).⁵⁶ The mixing curve determined the following: the Young 1-26, Holland 1-26, and Vernon-1 wells contained over 85 percent storage gas; the Mezger-1, Geesling-1, and Riffey V1-25 wells contained over 87 percent storage gas; the Young-1, Zink-1, Zink-A, and Zink-B wells contained over 65 percent storage gas; and the Schwertfeger 1-23 well contained approximately 75 percent storage gas.⁵⁷ The Commission believes that Northern's analytical methodology is sound. Accordingly, the Commission finds that the geochemical analysis of gas from wells in the primary gas migration pathway contain chemical concentrations consistent with that of storage gas, or a mix of storage gas and native gas.

55. Northern also presented data in Exhibit B-21 graphically depicting that helium concentrations in gas samples generally increased in wells furthest from the storage field.

⁵⁶ The mixing curves are presented in Exhibits B-22a through B-22e.

⁵⁷ The mixing curve for the Schwertfeger well is presented in Exhibit B-22e. Northern also presented isotopic results in Exhibit B-23 that appears to show gas from the Schwertfeger well is more closely associated with native gas.

As presented in Exhibit B-22e, there is approximately 25 percent native gas in the Schwertfeger 1-23 well. However, based on the isotopic data in Exhibit B-23, the Schwertfeger 1-23 well may contain higher concentrations of native gas. Since the Schwertfeger well is approximately 0.2 mile from the northern boundary of the proposed expansion area, it is reasonable to assume that native gas reserves also lie north of the proposed expansion area and in other areas in and around the proposed expansion area.

56. In summary, based on gas compositional data, the Commission finds that Northern has demonstrated the presence of storage gas in the primary gas migration pathway within the proposed expansion area, with higher concentrations of storage gas present in wells located nearest the Cunningham reservoir, and decreasing concentrations as the gas migration tracks north. As the migration pathway approaches the northern boundary of the proposed expansion area, native gas concentrations reach up to 35 percent.

2. Extent of Storage Gas Migration

a. Protests and Filings Regarding Gas Migration

57. The Nash Group suggests that expanding the field by more than 50 percent may not actually solve the underlying migration issue, causing Northern to later seek additional acreage to stop the leakage of gas from a formation that, as the Nash Group characterizes it, acts as a sieve. The Nash Group also avers that the data submitted by Northern does not justify expansion of the Cunningham field, stating that (1) Northern has not shown how storage gas is migrating northward; (2) native gas is present in the alleged migration path; and (3) Northern has not reconciled its various migration theories. Similar to Sabco,⁵⁸ the Nash Group states that Northern has not explained why less intrusive measures would not be equally effective in stopping the alleged migration of storage gas. The Nash Group expresses concern with step four of Northern's proposed management plan, which includes the use of existing wells, or outer containment wells, to prevent further third-party development. The Nash Group says that the necessity of step four calls into question whether the 14,240-acre expansion will fully contain the migration of storage gas.

58. In response to the concerns of the Nash Group, Northern contends that it does have a cohesive migration theory, asserting that third-party production is causing the migration and, thus, only stopping such production will solve the problem.⁵⁹ Specifically, Northern disagrees that a decrease in operating pressure would be effective,

⁵⁸ See Sabco November 24, 2009 Protest at 8.

⁵⁹ Northern October 28, 2009 Answer. See also Northern September 14, 2009 Application, Ex. Z.

citing the low bottom-hole pressures at which the third-party producers are operating. With regard to the abandonment of the containment plan from the October 2008 Order, Northern contends that any withdrawal wells would be overwhelmed by the third-party production Northern seeks to halt. Northern points out that not only have the two withdrawal wells approved in 2005 failed to prevent the migration of storage gas, but the substantial number of third-party operator wells in the southern part of the proposed expansion area have also failed to stop the migration from continuing in a northerly direction. Northern disputes that abandonment of the storage field would be in the public interest, stating that the field operated without problem before the third-party development.

59. In their joint protest, the County and Association aver that (1) the absence of storage gas in the Henrich 10-21 well contradicts Northern's gas migration claims; (2) Northern's theory of a three to four foot thick gas migration conduit through the proposed expansion area requires further investigation; and (3) the credibility and reliability of gas composition analysis depends upon the adequacy of sample collection and testing procedures, including the sampling procedures and chain-of-custody documentation. To that end, the County and Association state that much of the gas compositional data relied on by Northern is taken from KCC records and that they should have an opportunity to evaluate whether Northern's reliance on the KCC data is appropriate. The County and Association argue that if Northern would add omitted data from the Park 1 and Park 1A wells to its Exhibit B-21, the result would contradict Northern's attempt to establish a trend of declining helium. The County and Association point out there is no geochemical data for wells in sections 2, 3, 4, 6, 9, 11, 12, 28, 30, 31, 33, or 34 in the proposed expansion area and the large data gaps call into question Northern's migration theory, including the scope of any migration. The County and Association aver that further investigation is warranted to evaluate issues related to the absence of storage gas in the Simpson formation in the proposed expansion area.

60. In addition, the County and Association assert that Northern's seismic data is limited, contending that at most Northern's data demonstrate that the Viola formation is continuous from the northern Cunningham field fault to the new Guthrie 1-31 observation well, but show nothing about the region north of the Guthrie 1-31 observation well. The County and Association assert that the absence of faults or other structures that may limit gas migration has not been adequately demonstrated north of the Guthrie 1-31 well.

61. The County and Association further request that if the Commission were to accept Northern's theory of storage gas migration into the expansion area, the Commission should refrain from making findings of when that migration occurred, whether or not the migration was influenced by third-party producers, or specific percentages of native gas and storage gas in any particular well. The County and Association also request that Northern specify the property interests it seeks to acquire.

62. Finally, the County and Association state that if Northern's analysis of gas migration is found to be correct, since storage gas is now mixed with native gas, Northern is potentially interfering with valuable property rights of landowners, not the other way around. The County and Association are concerned generally about the presence of a storage field in their area that the operator appears not to fully understand. To that end, the County and Association suggest that if Northern is unable to contain storage gas, the solution is not to expand the field, but to abandon it.

63. In response, Northern points out that (1) the data available for wells in the proposed expansion area demonstrate that storage gas is present; (2) Northern may have shifted theories, but the Commission should be open to receiving new evidence, citing *Dominion Transmission, Inc.*;⁶⁰ (3) there is no reason to doubt the credibility of the KCC gas data; (4) Northern followed procedures, including strict chain-of-custody procedures,⁶¹ which the Commission found appropriate in the October 2008 Order and Northern also collected the samples in the presence of the owners of the third-party well operators; (5) adding the Park well data to its Exhibit B-21 in fact supports Northern's theory of the helium trend analysis;⁶² (6) third-party producer completion data support its theory of a highly permeable upper three to four feet interval of the Viola formation; (7) the inclusion of the Simpson formation in the expansion area is justified for the same reason the Commission authorized the 1996 expansion of the original field boundary, i.e. the formations are in communication and the inclusion of the Simpson is necessary for purposes of preventing wells completed in the Simpson from pulling gas from the Viola formation; and (8) Northern's new seismic data, when combined with previously collected seismic data in addition to structural data from wells in the expansion area, show that the Viola formation is extensive and without obstacles to migration of gas north of the Guthrie 1-31 well.

⁶⁰ 97 FERC ¶ 61,344, at 62,598 (2001) ("Dominion states that its understanding of the reservoir containment mechanism for the area covered by this application has developed over time with experience in operating the field."). See Northern October 28, 2009 Answer at 8.

⁶¹ Northern included copies of chain-of-custody documentation to substantiate its positions.

⁶² Northern October 28, 2009 Answer at 11-12. See Exhibits 48 and 49, which show decreasing helium concentrations in gas samples analyzed from the Park wells from 1987 to 2007.

64. Sabco⁶³ maintains that while boundaries of the Cunningham storage field have expanded, it is also irrefutable that Northern's estimations of the reservoir are unreasonable. In support of its assertion, Sabco presented affidavits of Dennis Hedke, a geologist and geophysicist, and Leonard L. Taylor, a petroleum engineer. Sabco contends that both experts agree that there is nothing to stop the continued migration of Northern's storage gas away from the originally certificated boundary of the Cunningham field.⁶⁴ Sabco states that Northern should not dismiss the containment plan originally proposed and discussed in the October 2008 Order in favor of the management plan because the management plan does not make sense. Rather, Sabco proposes an approach proffered by Mr. Hedke, which is to focus on a strategy of maintaining pressure and volume equilibrium, within the well-defined structural closure of the Cunningham anticline—an approach that could be conducted on acreage that Northern already controls.

65. Finally, Sabco contends that the Commission has an obligation to investigate whether the Cunningham field is no longer capable of performing the jurisdictional role it has been certificated to perform. To that end, Sabco suggests the Commission issue an order under section 5 of the NGA requiring Northern to show cause why the Cunningham storage field should not be abandoned.

66. In response to Sabco's protest, Northern contends that (1) containment wells alone will not stop third-party production of Northern's storage gas; (2) the opinion of Sabco's expert that Northern has overcharged the gas retention capacity of the Cunningham field by injecting too much gas and maintaining an excessive pressure is unsupported; and (3) Sabco's expert is wrong to say the proposed expansion area is inadequate to control the migration of storage gas.

67. Northern emphasizes that it agrees with the affidavits of Sabco's experts. In particular, Northern says the affidavits show that (1) third-party producers in the expansion area are producing storage gas as demonstrated by comparing third-party production with Northern's injection and withdrawal cycles and by analyzing gas samples; (2) the Viola formation is continuous throughout the expansion area; (3) the fault originally believed to contain the storage gas is no longer serving that function; and (4) once the storage gas migrates past the fault, there are no geologic barriers to prevent further migration. Given these facts, Northern also stresses that both Sabco experts agree

⁶³ Sabco states that it controls leasehold or farm-in rights on about 2,800 acres in the proposed expansion area and maintains interests in approximately 28,000 acres that lie north and northwest of the proposed expansion area. Sabco has no wells in the expansion area.

⁶⁴ Sabco November 24, 2009 Protest at 6.

that Northern is unable to contain the storage gas within the current certificated boundary. Northern dismisses Sabco's suggestion that the field should be abandoned, emphasizing the Cunningham field's capacity and flexibility as the only field in Northern's storage field arsenal capable of switching from injection to withdrawal on extremely short notice.

b. Commission Determination

68. The Commission finds Northern has demonstrated that there is a two-mile wide primary gas migration pathway from the storage field that is framed by a series of structurally high areas. The Commission further finds that Northern has demonstrated the presence of storage gas in certain wells located within this pathway. The question before the Commission here is whether the engineering and geological data presented demonstrate that Northern's estimation of the reservoir and protective boundaries is reasonable. While the Commission grants herein most of what Northern requests, the Commission finds Northern's estimation of the extent of gas migration and its estimation of the protective boundary is not fully justified.

69. The Commission finds that the Viola formation extends beyond the northern extreme of the proposed expansion area, and rises gradually upward to the north. The Commission also finds that the underlying Simpson formation may be in communication with the Viola formation in the proposed expansion area, as it is within the currently certificated storage boundary. The protesting parties have filed no data indicating any hydrocarbon production from the Simpson formation, nor any data to demonstrate that the Simpson formation is not in communication with the Viola formation. The Commission further finds that (1) a geologic migration pathway into the expansion area exists; (2) geochemical analysis demonstrates storage gas presence near the proposed northern border of the expansion area; and (3) there are no faults or other features that would prevent the further migration of storage gas beyond the northern boundary of the proposed expansion area, if Northern does not operationally control the migration of the storage gas.

70. The Commission finds that the engineering and geologic data indicate that within this primary gas migration pathway, native gas is present in varying concentrations. The highest concentrations of storage gas are found in wells located nearest the non-sealing fault, and native gas concentrations generally increase in wells located further north within the pathway. However, the engineering and geologic data do not definitively indicate storage gas presence in a portion of Northern's requested expansion area, in particular "section 28." The geologic and engineering data presented demonstrate pure native gas presence in the 16-32 well located within the Cunningham field's certificated boundary and the Henrichs 1-21 well located less than one-half mile west of the western edge of the primary gas migration pathway. In addition, prior to the initial fill of the Cunningham field, data demonstrates that the Park 1 and Park A1 wells contained pure native gas. The Commission notes that these wells are in areas where the Viola

formation is at a structural high. As discussed above, the engineering and geologic data demonstrate that hydrocarbon resources in and around the Cunningham field typically accumulate in structurally high areas within the Viola formation.

71. As previously discussed, other oil wells, gas wells, and oil and gas wells in close proximity to the Cunningham field's certificated boundary and the proposed expanded buffer zone are in locations where the Viola formation is at a structural high. Exhibit 12 of Northern's application shows that section 28 is also typified by a structural high. Thus, the Commission finds it is reasonable to conclude that native hydrocarbon resources are associated with this structural high in "section 28." However, as the geochemical analysis of gas from wells within the primary gas migration pathway demonstrates, native gas concentrations are also found in structurally lower regions of the rising Viola formation.

72. Northern presented production data from expansion area wells in Exhibits 15-23 of its application to demonstrate that storage gas is present in the entire proposed expansion area. However, Northern did not independently assess "section 28" production versus that of wells in the primary gas migration pathway.⁶⁵ Exhibit 20.1 shows that production in the average Kansas Viola wells initially increases before production declines, followed by slight increases and decreases in production for the first four years assessed.

73. Exhibit 21 shows that the average production from Kansas Viola wells initially increases in rate from 3,461 to approximately 5,337 Mcf per month (Mcf/mo) per well, then gradually declines to approximately 1,777 Mcf/mo per well with slight increases and decreases in production rates associated with typical depletion curves. Exhibit 21 also provides average production data for the top five Kansas Viola wells and shows an initial increase in production from 2,615 to approximately 12,388 Mcf/mo per well, followed by a gradual decline to approximately 6,882 Mcf/mo per well with slight increases and decreases of production rates associated with the declining production during the initial four years of production.

74. Exhibit 20.1 shows that wells in the proposed expansion area produce more than the average Kansas wells and exhibit highly variable production rates that generally increase over four years. Exhibit 17 provides monthly production data for expansion area

⁶⁵ Northern provided production data for the following "section 28" wells: Trinkle #1-28, Trinkle #1-33, Gard #1, Koenenmann #1, and Pruitt #1-29.

wells.⁶⁶ Analysis of the production data from the five “section 28” wells for which data was provided show that production decreases from highs in the initial months of production, to lows in the last month recorded. Exhibit 17 also shows that production rates for the five “section 28” wells assessed are either consistent with, or significantly below, both average and the top five Kansas Viola wells. In June 2009, the last month for which production volumes were recorded, the following volumes were recorded: Pruitt 1 – 854 Mcf; Gard 1 – 222 Mcf; Koenenmann 1 – 2,933 Mcf; Trinkle 1-28 – 1,492 Mcf; and Trinkle 1-33 – 2 Mcf.⁶⁷

75. Exhibits 16.1 for the Gard 1 well and 16.5 for the Trinkle 1-33 well reveal minor production volumes that generally decline, thus indicating little to no evidence of production of storage gas that Northern avers is present in these wells. Further, Exhibit 21 shows that the average production from expansion area wells increases from 4,998 Mcf/mo at month one, to 8,309 Mcf/mo after 22 months of production. Exhibit 17 shows that the “section 28” well with the most data, the Trinkle 1-33 well, only produced 261 Mcf/mo at month one and has decreased to 2 Mcf/mo after 22 months. Only an average of 10 months of production data was available for each “section 28” well assessed. Therefore, the Commission cannot adequately assess whether fluctuations in volumes produced may be related to production of migrated storage gas.⁶⁸ Lastly, Northern has produced no geochemical data to indicate that storage gas may be present in wells located in “section 28.”

76. As discussed above, the data presented in this proceeding clearly indicates that native hydrocarbon resources are typically found where the Viola formation is at a structural high. This is true for the areas within the certificated boundary, within the proposed expansion area, and in areas in close proximity to the expansion area. “Section 28” is typified by a structurally high area. Thus, the Commission concludes that

⁶⁶ “Section 28” wells for which data was provided include: Gard 1 (6 months of data), Koenenmann 1 (12 months), Pruitt 1 (3 months), Trinkle 1-28 (6 months), and Trinkle 1-33 (22 months).

⁶⁷ Exhibits 16.1 – 16.9 are graphical depictions of production data from Exhibit 17.

⁶⁸ The average production for Kansas Viola wells after one year is 3,769 Mcf/month. The two “section 28” wells with at least a year of production data available are Koenenmann 1 – 2,933 Mcf/month at month 12 of 12 reported and Trinkle 1-33 – 367 Mcf/month at month 12 of 22 reported. Thus, production rates from these two wells are at rates considerably lower than that of average Kansas Viola wells after one year of production.

hydrocarbon resources, including native gas, are likely to be found in wells completed in the Viola formation in “section 28.”

77. The data presented by Northern that assesses expansion area production as a whole provides further support for the Commission’s determination. Northern’s data does not adequately address “section 28” area production independently from the expansion area as a whole. The engineering and geologic data provided for production from wells in “section 28” is consistent with, or significantly below, average production from Kansas Viola wells. Further, production data that is available for “section 28” does not support a generally increasing linear production trend that Northern asserts demonstrates production of storage gas in other parts of the proposed expansion area, mainly within the primary migration pathway. Thus, the Commission will not authorize Northern to expand its storage field into the following sections, totaling 1,920 acres, which the Commission has referred to herein as “section 28”:

Pratt County, T26S, R11W

SE ¼ section 20; N ½ section 21; section 28; E ½ section 29; NE ¼ section 32; N ½ section 33.

78. The Commission will authorize Northern to expand the Cunningham storage field by 12,320 acres into the sections that comprise the primary gas migration pathway and in adjacent sections as well, as follows:

Pratt County, T26S, R11W

Sections 23, 24, 25, 26, 27, 34, 35, 36, S ½ section 22 and SE ¼ section 33

Pratt County, T27S, R11W

Sections 1, 2, 3, 10, 11, 12, E ½ section 4 and E ½ section 9

Kingman County, T26S, R10W

Sections 30 and 31

Kingman County, T27S, R10W

Sections 6 and N ½ section 7

79. However, the Commission will require in addition, that Northern design and implement a plan that will prevent the migration of storage gas beyond the newly authorized boundary, because the Commission agrees with Sabco that the integrity of the storage field is substantially at risk. The Commission finds that shutting in all of the

wells in the authorized expansion area will not by itself stop gas from continuing to migrate north, especially since there is nothing to prevent third-party producers from completing wells beyond the expansion area's northern boundary. The Commission is concerned about the successive facilities and expansion requests sought by Northern to control its storage gas migration issue at the Cunningham storage field. Most recently, in 2007, Northern stated that its five-step "containment plan" would manage the migration of gas in the Cunningham field.⁶⁹ Northern completed only one phase of that containment plan prior to filing its application here. Subsequently, Northern stated that increasing numbers of third-party wells had caused an exponential increase in production and that its containment plan would no longer control the storage gas migration. The Commission is concerned that this cycle of third-party production, continued migration, and requests for further expansion will continue.

80. In this proceeding, Northern seeks authorization of a four step "management plan" in which it proposes to (1) shut in all third-party production north of the northern fault; (2) monitor pressures to see if they return to pre-migration levels of 1995; (3) implement a water injection program to re-pressurize the proposed expansion area if the pressures do not return to pre-migration levels in a "reasonable" period of time; and (4) have the option of bringing shut-in wells into production or installing wells to offset third-party production, if third-party producers choose to drill Viola production wells adjacent to the proposed expansion area.

81. In reference to step 1 of its proposed management plan, Northern states:

Stopping the production of such enormous volumes of gas and water by the third-party wells will eliminate the large pressure sink they have created, put an end to storage gas production by third parties, and thereby allow the storage field to stabilize and operate as it has in the past prior to the drilling of the third-party wells.⁷⁰

82. The Commission agrees that this component of the management plan could be effective as a first step in resolving the gas migration issue at the Cunningham field. The Commission also agrees that steps 2 and 3 could help to restore and manage pressures in the authorized acreage and allow the field to stabilize. However, the Commission is troubled by step 4 of Northern's management plan to the extent that it is based on reacting to the actions of others.

⁶⁹ Northern March 16, 2007 Application, Ex. Z, Docket No. CP07-107-000, at 24.

⁷⁰ Northern December 9, 2009 Answer at 5.

83. Step 4 of Northern's proposed management plan is speculative and reactive in nature. It provides that only if Northern deems additional third-party production to be an attempt to capture migrating storage gas will it implement step 4 of its plan, which could thereby re-establish pressure sinks at locations yet to be determined and may further exacerbate storage gas migration at the Cunningham field.⁷¹

84. Without a more robust, aggressive, and proactive plan on the part of Northern, the Commission can envision this cycle repeating. Therefore, the Commission will not authorize the proposed management plan. Rather, the Commission will require Northern to file within two months of the date of this order a comprehensive and specific containment and management plan detailing how it will effectively slow and reverse the flow of gas out of the field. The plan should be designed to go into effect within six months of the date of this order.

85. The Commission will also require Northern to file quarterly reports on all actions taken and include an assessment of the results of those actions on halting the migration of storage gas. These reports should include, at a minimum, the volume of gas injected during the period, volume withdrawn, the pressure in the storage field, and the pressure in the expanded buffer zone.⁷²

86. The Commission believes that the approved expansion acreage is sufficient for Northern to implement actions it must take in order to resolve the gas migration issue at the Cunningham storage field. The Commission will not indefinitely authorize further expansions of the Cunningham field to areas where storage gas has migrated. Third-party producers have rights to produce native hydrocarbon resources, and it is against these meaningful rights that the Commission must balance its findings. The Commission believes that it is incumbent upon Northern to effectively manage its storage field in a

⁷¹ In its protest, Sabco states that it maintains interests in approximately 28,000 acres to the north and northwest of the proposed expansion area, and that it is this acreage that Sabco seeks to protect. That being the case, it is reasonable to assume that Sabco may, at some time in the future, wish to develop hydrocarbon resources in that acreage.

⁷² The Commission emphasizes that Northern has not proposed to use any of the authorized expansion area for the injection or storage of natural gas and this order provides no authorization for such activities. In order to monitor Northern's progress toward acting within the bounds of its certificate authority, the Commission orders the quarterly reporting discussed above. Northern is reminded that it may only inject gas into wells located south of the northern fault within the originally certificated reservoir boundary.

manner that prevents the migration of storage gas beyond any Commission authorized boundary.

VI. Environmental

87. On October 16, 2009, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment* (NOI). The Commission received comments from two individuals who expressed general opposition to Northern's proposed storage field expansion without citing any environmental issues. The Commission also received comment letters from the KCC and the County and Association. The KCC requested cooperating agency status in the preparation of the staff's environmental assessment (EA). By letter dated December 2, 2009, the Commission denied the KCC's request for cooperating agency status because the KCC is an intervenor in this proceeding.

88. The KCC and County and Association expressed their concern for water quality in surrounding fresh water aquifers that may be impacted by the storage field expansion. The KCC and County and Association also asked for an assessment of the effects that any past gas migration has had on public and private groundwater or surface water in or near the Cunningham field and whether the storage field has adequate containment mechanisms.

89. To satisfy the requirements of the National Environmental Policy Act, our staff prepared an EA for Northern's proposal that was placed into the public record, and mailed to the affected landowners and stakeholders on January 29, 2010. The EA addressed geology, soils, water resources, groundwater and surface water contamination, fisheries, wetlands, vegetation, wildlife, threatened and endangered species, cultural resources, land use, visual resources, air quality, and noise, and found no environmental impact on any of these resources as a result of the current proposal.

90. The EA addressed the KCC's and the County and Association's comments to the NOI regarding potential impact on groundwater. The EA concluded that since Northern's proposed storage field expansion does not involve the construction of any facilities, no groundwater impacts would result from approval of this proposal. Any subsequent jurisdictional construction activities in the expanded buffer zone, as well as potential abandonment of the field, would be subject to further environmental review upon Northern's filing for Commission authorization. The County and Association's concerns about the adequacy of the containment mechanisms of the Cunningham field is addressed above in this Order.

91. The KCC alleges that the EA failed to adequately evaluate the alternatives to Northern's proposal, suggesting that abandonment of the storage field or reduced

operating pressure and volume should have been considered.⁷³ Abandonment of the storage field or pressure and volume reduction were not considered to be reasonable alternatives at this time because there is the possibility that Northern could halt the gas migration and stabilize the storage field for continued service. Further, the Commission finds that the KCC has not provided any information that challenges the EA's determination that the shallow aquifers in the expanded buffer zone are in any way threatened by Northern's storage gas. The Commission reaches this conclusion based on the impermeable Kinderhook formation and the lack of any evidence that groundwater contamination of water wells has occurred in the past.

92. Based on the discussion in the EA, and noting in particular that no facilities are proposed to be constructed in this proceeding, the Commission concludes that if undertaken in accordance with Northern's application, approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment.

93. Any state or local permits issued with respect to the jurisdictional facilities authorized herein must be consistent with the conditions of this certificate. The Commission encourages cooperation between interstate pipelines and local authorities. However, this does not mean that state and local agencies, through application of state or local laws, may prohibit or unreasonably delay the proposals approved here by this Commission.⁷⁴

VII. Conclusion

94. For the reasons discussed above, and with the conditions imposed by this order, the Commission concludes that the public convenience and necessity require certificate authorization for Northern to expand the certificated boundary of the Cunningham storage field, as discussed herein.

95. The Commission, on its own motion, received and made a part of the record in this proceeding all evidence, including the application, as supplemented, and exhibits thereto, submitted in support of the authorization sought herein and upon consideration of the record,

⁷³ See KCC February 25, 2010 Comments on the EA.

⁷⁴ See, e.g., *Schneidewind v. ANR Pipeline Co.*, 485 U.S. 293 (1988); *National Fuel Gas Supply v. Public Service Commission*, 894 F.2d 571 (2d Cir. 1990); and *Iroquois Gas Transmission System, L.P., et al.*, 52 FERC ¶ 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

The Commission orders:

(A) A certificate of public convenience and necessity is issued to Northern authorizing the expansion of Northern's certificated buffer zone to include the Viola and Simpson formation in Pratt and Kingman Counties, Kansas, as described in the body of this order.

(B) The certificate issued in Ordering Paragraph (A) is conditioned on Northern's:

(1) injecting no gas for storage into the Viola or Simpson formations north of the non-sealing fault;

(2) complying with all regulations under the NGA including, but not limited to, paragraphs (a), (c), (e) and (f) of section 157.20 of the Commission's regulations.

(C) Northern is required within two months of the date of this order to file a comprehensive and specific containment and management plan detailing how it will effectively slow and reverse the flow of gas out of the field. The plan should be designed to go into effect within six months of the date of this order. Northern is further required to file quarterly reports on all actions taken and an assessment of the results of those actions on halting the migration of gas. The reports should also include, at a minimum, the volume of gas injected during the period, volume withdrawn, the pressure in the storage field, and the pressure in the expanded buffer zone.

(D) When Northern files under section 4 of the NGA to recover the costs of the expansion as authorized herein, there shall be a presumption of rolled-in rate treatment for such costs, absent a significant change in circumstances.

(E) Northern shall notify the Commission's environmental staff by telephone, e-mail, and/or facsimile of any environmental noncompliance identified by other federal, state, or local agencies on the same day that such agency notifies Northern. Northern shall file written confirmation of such notification with the Office of the Secretary within 24 hours.

(F) The request for a technical conference is denied.

(G) The request for an evidentiary hearing is denied.

By the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
Deputy Secretary.