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## **Chapter 11**

### **Summary of Potential Impacts and Mitigation Measures**

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**Chapter 11 – Summary of Potential Impacts and Mitigation Measures**

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## **Chapter 11 SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES**

A complete description of the potential impacts associated with horizontal drilling and high-volume hydraulic fracturing is presented in Chapter 6. The mitigation measures proposed to minimize those impacts are discussed in Chapter 7, while the associated Supplementary permit conditions are provided in Appendix 10. Additionally, Chapter 8 includes descriptions of other applicable state and federal regulatory programs which have authority over activities associated with natural gas well development. Table 11.1 below provides a summary of the potential impacts and proposed mitigation measures.

Table 11.1 Summary of Potential Impacts and Proposed Mitigation Measures

RESOURCE	IMPACT	dSGEIS section	dSGEIS PP.	GEIS sec.	GEIS PP.	MITIGATING MEASURE	dSGEIS section	dSGEIS PP.	GEIS sec.	GEIS PP.
Water resources	Depletion of water supply in streams.	6.1.1.1				Requires determination of and adherence to passby flow for each surface water proposed for withdrawals using the Natural Flow Regime method.	7.1.1.4			
	Reduced stream flow and degradation of a stream's best use.	6.1.1-2				Same as above.				
	Loss or impairment of aquatic habitat, aquatic ecosystems, or aquifer recharge ability in surface waters.	6.1.1.3-6				Same as above.				
						Requires site-specific SEQRA review from any lake or pond.	7.1.1.4			
	Long-term damage to groundwater resources	6.1.1.5				Requires pump testing and site-specific SEQRA for groundwater withdrawal near wetlands and water wells	7.1.1.5			
	Cumulative surface water withdrawal impacts.	6.1.1.7				Addressed by individual passby flow determinations as above.	7.1.1.6			
	Contamination of surface and/or subsurface waters from stormwater runoff.	6.1.2		16.B.3.a,b	16-12..15	Requires erosion prevention and sediment control through development of and adherence to a SWPPP through a SPDES permit.	7.1.2			
						Requires application for and coverage under the General Permit before commencement of operations.	7.1.2			
						Authorizes permit conditions on a case-by-case basis regarding erosion and sediment control in watersheds of drinking water reservoirs.			17.B.1.j	17-6
						Specifies a reclamation timetable of 45 days following cessation of drilling.			17.B.2.c	17-7
					Requires a Stream Disturbance Permit when project is w/in 50' of a protected stream. Authorizes permit conditions on a case-by-case basis regarding stream crossings, access roads, EPSC measures, and reclamation.			17.B.1.d	17-4..5	
					Well pads for high-volume hydraulic fracturing prohibited within 2000' of public drinking water wells, river or stream intakes and reservoirs.	7.1.12.1		17.B.1.c	17-4	
					Specifies setback distances from structures, surface waters, public/private water wells, and water supply springs.	7.1.12.1		17.B.2.a	17-6..7	

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<i>Water resources (cont.)</i>	Contamination of surface waters, groundwater, or drinking water aquifers from chemical, fuel, or lubricant spills (including drilling and fracturing fluids).	6.1.3		16.B.4.a,c	16-16..19	Requires reporting in EAF addendum of location of fuel tanks relative to surface waters, wetlands, drinking water wells, and aquifer boundaries.	7.1.3.1			
						No well pads within 500' of a private water well, unless waived by the landowner.	7.1.3.1			
						Specifies continuous monitoring of refueling operations.	7.1.3.1			
						Requires spill response and cleanup to be addressed in the SWPPP by inclusion of Best Management Practices to control, remediate, and clean up spills.	7.1.3.1			
						Individual crew member responsibilities must be posted for well-control. Blowout Preventers (BOPs) must be adequately sized and tested.	7.1.3.2			
						Affords DEC option to implement location-specific HVHF fluid management restrictions and permit conditions.	7.1.3.3			
						Hydraulic fracturing fluid additives should be required by permit condition to be placed in lined containment areas.	7.1.3.3			
						Identification of a spill response team and employee training on proper spill prevention and response techniques.	7.1.3.3			
						Requires a closed-tank system for flowback water handled at the wellpad.	7.1.3.4			
						Requires reporting EAF addendum on quantity, worthiness, volume, and location of tanks to accept flowback water.	7.1.3.4			
Promote reuse of flowback water	7.1.3.4									
Requires operators to consider less toxic alternative hydraulic fracturing fluid additives.	8.2.1.2									
Limits duration of fluid impoundment after permanent/temporary suspension of drilling/hydraulic fracturing.	7.1.3.4									
<i>Water resources (cont.)</i>	Contamination of surface waters, groundwater, or drinking water aquifers from chemical, fuel, or lubricant spills (including drilling and fracturing fluids). (cont.)					Specifies continuous supervision of fluid transfer activities.	7.1.3.4			

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RESOURCE	IMPACT	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.	MITIGATING MEASURE	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.
						Specifies spill prevention and response BMPs to be addressed in SWPPP. At least two vacuum trucks must be on standby at the wellsite during the flowback phase.	7.1.3.4			
						Requires dikes around oil storage tanks.			17.B.2.f	17-7
						References requirement for BOPs on wells in NY state.			17.C.1.l	17-12
						Subjects operators to enforcement actions and penalties upon release of flowback fluids onto the ground.			17.C.1.m	17-12
						Affords right to the department to require fluid-level monitors on tanks where repeated overflows have occurred.			17.D.2.c	17-16
						Specifies frequency and character of sampling, testing, and reporting of nearby private water wells before, during, and after drilling and HVHF activity.	7.1.4.1			
						Affords DEC the right to curtail or modify operations when a well complaint and a non-routine wellpad incident coincide.	7.1.4.1			
<i>Water resources (cont.)</i>	Contamination of groundwater/aquifers from natural gas, drilling fluids, or HVHF fluids in the wellbore.	6.1.4				No well pads for high-volume hydraulic fracturing within the boundaries of a primary aquifer.	7.1.3.5		17.C.1.q	17-12..13
						No well pads for high-volume hydraulic fracturing permitted within 500' of a primary aquifer	7.1.3.5			
						No well pads for high-volume hydraulic fracturing within 500' of a principal aquifer without site-specific SEQRA review and an individual SPDES permit	7.1.3.5			
						Requires operator to test private water wells	7.1.4.1			
						Specifies permit conditions for more stringent casing construction and cementing, reporting of well information, and testing of cement job for HVHF wells.	7.1.4.2			
						Requires departmental notification prior to surface casing cementing.	7.1.4.2			
						Specifies constant venting of annulus to prevent pressure buildup, unless the annular gas is to be produced, in which case the equipment and production pressure must receive departmental approval.	7.1.4.3			

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						Requires diligence of operator in researching, locating, characterizing, and reporting public and private water wells within 2640 feet (1/2 mile) of proposed well.	7.1.12.1			
						Operators must identify and characterize any existing wells within the spacing unit and within one mile of proposed well and plug any abandoned well which is open to the target formation or is otherwise an immediate threat to the environment.	7.1.6			
						Specifies methods and materials for the installation and cementing of the various casings, including the dimensions of cementing to isolate the producing and other gas-bearing formations from overlying, potentially, water-supplying formations.			17.C.1.g-j	17-8..11
						State Inspector must be present during surface and production string cement jobs. State may order remedial cement work.			17.C.1.q	17-12
<i>Water resources (cont.)</i>	<i>Contamination of groundwater/aquifers from natural gas, drilling fluids, or HVHF fluids in the wellbore. (cont.)</i>					Requires continuous venting of annulus.			17.C.1.q	17-13
						Requires properly plugging and abandoning well by isolating hydrocarbon bearing formations with cement plugs, heavy mud, and casing withdrawal.			17.E.1.c-d	17-17..18
						Further specifies plugging materials and methods to ensure vertical isolation across the well depth.			17.E.2.c-d,f,h-m	17-19..22
						Limits duration of temporary abandonment of wells.			17.E.1.e-f	17-18
						Extends limits on duration of temporary abandonment to all wells (see 17.E.1.e-f).			17.E.2.o	17-23
						Affords the department the right to take temporary possession of and plug any well in case of operator neglect or unpermitted abandonment, and requires financial security prior to application to fund said operation.			17.E.1.a,j	17-17..18
	Contamination of aquifers/ groundwater from hydraulic fracturing	6.1.5				Requires site-specific SEQRA review of HVHF permit applications to produce from a formation with < 1000' of vertical separation from potential or known subsurface water supplies. (see 6.1.5.2)	7.1.5			

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<i>Water resources (cont.)</i>	Contamination of surface or subsurface water with HVHF or drilling fluids from container leakage, structural failure, or improper transportation.	6.1.6		16.B.3.b,c	16-14..15	Closed-tank systems must be used for flow-back of wells.	7.3.1.2			
						Requires impermeable liner in drilling reserve pits.		17.C.1.o	17-12	
						Limits duration on impoundment of waste fluids to 45 days after drilling operations.		17.C.1.p	17-12	
						Specifies methods and materials for pit liners.		17.C.2.k-l	17-15	
<i>Water resources (cont.)</i>	Contamination of soil or water from improper disposal, transportation, or release of waste solids or fluids (including HVHF flowback).	6.1.6-9				Flowback water may not be spread on roads. Requires coverage under a Part 364 permit and submission of BUD application for road-spreading of produced brine (includes independent analysis of brine composition). BUDs for Marcellus brine will not be issued until additional data on NORM content is available and evaluated.	7.1.7.2			
						Cuttings must be disposed of in MSW landfills if well drilled on oil-based or polymer-based mud. Cuttings may be disposed of on location only if well drilled on air or water.	7.1.9			
						Prohibits annular disposal of drill cuttings.	7.1.9			
						Requires landowner permission to bury trash or pit liners onsite.		17.B.2.e	17-7	
						Specifies safe disposal of waste oil and flammables.		17.C.1.d	17-8	
						Requires a department-approved brine disposal plan.		17.D.2.b	17-16	
						Requires proper handling of well construction waste fluids and holding tanks for produced fluids.		17.C.1.q	17-12..13	
						Sets timetable for waste fluid disposal to 45 days after cessation of drilling.		17.D.2.a	17-16	
<i>Water resources (cont.)</i>	Contamination of soil or water from improper disposal/release of waste solids or fluids (including HVHF flowback) into the environment. (cont.)					Specifies and requires record-keeping of generation, transfer/hauling, and receipt of flowback wastewater.	7.1.6.1			
						Prohibits spreading of HVHF flowback water on roads.	7.1.6.2			

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RESOURCE	IMPACT	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.	MITIGATING MEASURE	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.	
Water resources (cont.)	Degradation/contamination of the NYC/unfiltered water supplies.					Requires submission of a fluid disposal plan for flowback water which specifies quality, maintenance, and monitoring of piping and conveyances.	7.1.6.3				
						Requires application and pre-approval of POTWs proposing to dispose of flowback and production waters. Specifies application contents (e.g. headworks analysis, waste fluid characterization, regulatory limits) and demonstration that final discharges will fall within regulatory limits.	7.1.8.1				
						Requires SPDES coverage of any private wastewater treatment facility proposed to accept waste fluid.	7.1.8.1				
						Restates governance of EPA UIC permit over proposed injection well disposal. Notes site-specific SEQRA review for each injection well.	7.1.8.2				
Floodplains	Contamination of surface waters from the release into the environment of chemical pollutants in a flood event.	6.2				No well pads for high-volume hydraulic fracturing in the New York City or Syracuse watersheds or within a 4000' buffer of the watersheds.	7.1.10				
Freshwater Wetlands	Contamination of freshwater wetlands from accidental release of drilling or HF fluids, chemicals, or fuel.	6.3		16.B.2.d	16-7.8	For Department-regulated wetlands, makes permit approval dependent on site-specific SEQRA review and coverage under any necessary wetlands permits.	7.3				
						Specifies setbacks between fuel tanks and wetlands at a mandatory 500 feet.	7.3				
						Requires SPOTS 10 secondary containment for any fuel tank.	7.3				
						Requires a Wetlands Permit when project is w/in 100' of a freshwater wetland > 12.4 ac. in size or of unique local significance. Authorizes permit conditions on a case-by-case basis regarding location and timing of activities/facilities and replacement of lost wetland acreage.			17.B.1.f	17-5	
Ecosystems and Wildlife	Degradation of local ecosystem from fragmentation of habitat	6.4.1				Requires operator to develop and employ Best Management Practices for surface disturbance to reduce habitat impacts.	7.4.1				
						Restricts operations during mating and migration seasons in certain habitats	7.4.1				

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						Requires pre-drilling and post-completion animal and plant surveys when well pads are located in 150-acre or larger forest patches within Forest Focus Areas or 30-acre or larger grassland patches within Grassland Focus Areas.	7.4.1			
	Degradation of local ecosystem functions and native biological communities from the introduction of invasive species.	6.4.1				Requires operator diligence in exploiting accepted BMPs for removal and preventing introduction of invasive species.	7.4.2.1			
						Requires baseline surveying and reporting of project site for existence of invasive species.	7.4.2.1			
						Affords DEC the right to apply permit conditions for invasive species management when outside of the DRB and SRB.	7.4.2.2			
						Relies upon DRBC and SRBC protocols for aquatic invasive species management in their respective jurisdictions.	7.4.2.2			
<i>Ecosystems and Wildlife (cont.)</i>	Harm to local wildlife populations from the loss of habitat	6.4.3		16.B.2.b	16-6..7	Requires partial and final well pad reclamation.	7.4.1			
	Impacts to State-Owned Lands	6.4.4				No surface drilling allowed on specified State-owned lands.	7.4.4			
Air Quality	Degradation of Air Quality	6.5		16.B.2.f	16-9..10	Specifies minimum exhaust-stack heights, restrictions on public access, and sulfur content of fuel-oil.	7.5.3.1			
						Prohibits use of the BTEX class of compounds as additives in HVHF fluid surface impoundments.	7.5.3.2			
						Requires reporting of fracturing additives and public access restrictions.	7.5.3.2			
						Requires catalytic technology for production equipment.	7.5.3.3			
Greenhouse Gas Emissions	Emission of gases with Global Warming Potential due to natural gas well drilling and production.	6.6				Requires development of a GHG emissions impacts mitigation plan, requires development of a leak detection and repair program, and encourages participation in the USEPA's Natural Gas STAR program. Requires reduced emission completions where a pipeline is available.	7.6.8			
Naturally Occurring Radioactive Material (NORM)	Exposure of workers, the public, and the environment to harmful levels of radiation.	6.8				Outlines necessary monitoring work.	7.8.2			
						Requires NORM testing of discharged waste fluids and material in production tanks.	7.8.2			

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RESOURCE	IMPACT	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.	MITIGATING MEASURE	dSGEIS section	dSGEIS pp.	GEIS sec.	GEIS pp.
Visual Impacts	Temporary new landscape features at well pads, new offsite facilities, congested appearance of campsites and staging areas, increase in specialized traffic.	6.9		16.B.2.e	16-8	Permit conditions would require operation consistent with a visual impacts mitigation plan. Site-specific assessment could result in additional design and siting requirements.	7.9			
Noise	Temporary impacts but could occur on 24-hour basis. Potential 37-42 dB increase over quietest background at 2,000 feet during drilling and hydraulic fracturing. Increased traffic noise near well pad. Noise along approach and departure corridors from increased airplan service.	6.10		16.B	16-2	Operator must submit and adhere to a noise impacts mitigation plan. Site-specific assessment could result in specific mitigating permit conditions.	7.10		17.B.1.b	17-4
Transportation	Increased traffic on roadways; damage to local roads, bridges and other infrastructure; damage to state roads, bridges and other infrastructure; increased number of breakdowns and other accidents; risk of potentially hazardous spills; traffic impacts near rail centers.	6.11				Potential for road use agreements between operators and municipalities. Requirement to file a transportation plan that includes proposed routes and a road condition assessment. Site-specific assessment could result in additional traffic safety requirements, first responder emergency response training or avoidance of sensitive locations for trucks carrying hazardous materials.	7.11			
Socioeconomic & Community Character	Positive impacts on employment and income; increased economic activity; potential localized housing shortages; positive and negative impacts on state and government spending; increased tax revenues and production royalties; increased demand for local services; potential changes in the economic, demographic and social characteristics of affected communities that could be viewed as negative by some and positive by others.	6.8 & 6.12		16.B.2.h	16-10..11	This section will be updated after July 31, 2011.	7.8 & 7.12			

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