their requirements for complying with antidegradation requirements, and provides greater assurance that permittees will not cause or contribute to a lowering of water quality.

VI.2.4 Use of Cationic Treatment Chemicals. (Part 1.2.4)

If the operator plans to use cationic treatment chemicals (as defined in Appendix A), they are ineligible for coverage under this permit, unless they notify the applicable EPA Regional Office in advance and the EPA office authorizes coverage under this permit after they have included appropriate controls and implementation procedures designed to ensure that their use of cationic treatment chemicals will not lead to a violation of water quality standards. In the absence of such authorization, to use cationic treatment chemicals at the site, the operator must apply for and receive coverage under an individual permit.

- *Purpose:* To clarify what operators electing to use cationic chemicals must do to be eligible for coverage under this permit and when they are ineligible for coverage, and therefore must seek coverage under an individual NPDES permit.

Background

A number of coagulants and flocculants, including polymers, are available on the market and are in wide use for the control of pollutants, not only on construction sites, but to reduce sediment from agricultural fields and to reduce pollutants in discharges from wastewater treatment plants to name a few (74 Fed. Reg. 63008). EPA had anticipated that, with the promulgation of a numeric turbidity limit in December 2009, the number of sites that would want to employ treatment chemicals would rise significantly. Although the use of treatment chemicals was not specifically required in the originally promulgated numeric effluent limit (which has since been stayed), the technology basis underlying the numeric limit was "passive treatment", which itself relied on the addition of polymers to enhance the sediment removal capabilities of standard erosion and sediment controls. Because the exceedance of the effluent limit would have been considered a permit violation, EPA expected that many site operators would have elected to use treatment chemicals in order to ensure a high rate of sediment removal and a better chance of compliance, as compared to strictly relying upon the use of standard sediment and erosion controls.

Now that EPA has stayed numeric turbidity limit, and a recalculated limit has not yet been promulgated, this permit does not include a numeric limit for turbidity. In the absence of a specific turbidity limit, EPA does not expect there to be a significant increase in the of treatment chemicals at permitted construction sites. EPA is, however, aware that in some areas covered by this permit, operators are being required to meet end-of-pipe turbidity limits based on the applicable water quality criteria for the receiving stream. Where they are subject to such requirements, there already has been an expressed interest in using treatment chemicals to ensure that they are discharging in compliance with the receiving water turbidity limits. Because such permittees covered by this permit are likely to choose to utilize treatment chemicals at their sites, EPA needs to ensure that these chemicals are properly used.

In the context of the C&D rule, EPA found that with the right operator training and proper usage, chemicals can be used properly on sites to avoid risk to aquatic species. In that context, EPA's evaluation of passive treatment technologies included consideration of potential environmental risks of relying on chemical addition. The following is an excerpt from the C&D rule's discussion of these issues:

> "Knowledge from toxicity studies suggest that polymers are highly variable as to their toxic effects on aquatic organisms (see discussion of toxicity in the Environmental Assessment). … While EPA recognizes that there is the potential for problems due to improper application of polymers, EPA has determined that when properly used, environmental impacts from polymers or flocculants should not occur through the use of passive treatment systems. The dose ranges where polymers are utilized on construction sites are well below the chronic toxicity levels. The utilization of polymers on construction sites has occurred for a significant period of time and they are currently being used on construction sites throughout the nation. EPA recognizes the merits of ensuring that polymers or other chemical additives, if necessary, are properly used. Permitting authorities should carefully consider the appropriateness of usage of these materials where there are sensitive or protected aquatic organisms in the receiving waters, including threatened or endangered species and their critical habitat. NPDES permitting authorities may establish controls on dosage and usage, protocols for residual toxicity testing, require prior approval before the use of particular polymers, training requirements for site operators or other measures they deem appropriate." 74 Fed. Reg. 63008.

Therefore, while concluding that environmental risks would be minimized by ensuring that these chemical additives are properly used and that the permitting authority should play a lead role in determining what is deemed proper usage as a whole or in individual cases, EPA also recognized that there may be certain chemicals the use of which may require individualized review. In addition, EPA recognized that there may be instances where the use of chemicals would be inappropriate given the sensitivity of aquatic species, suggesting the importance of evaluating chemicals and determining if and under what circumstances they can be used.

EPA's proposed permit included a number of provisions related to the use of treatment chemicals. While the use of chemicals would have been authorized under the proposed permit, EPA proposed to prohibit the discharge of a specific class of chemicals (i.e., cationic treatment chemicals[1]), except in conformance with local and state requirements, and requested comment on the way in which these chemicals should be regulated. A common theme among the comments was that EPA should take extreme precaution when authorizing the use of these chemicals, especially in light of data suggesting that they are acutely toxic to aquatic species and the fact that the use of chemicals on construction sites is far different from the type of highly engineered systems used for water or wastewater treatment. In response to the comments received on the use of these chemicals, EPA conducted additional research regarding the relative toxicity of cationic chemicals for aquatic species. EPA confirmed that cationic chemicals have been found to be acutely toxic to some species. EPA's research is encapsulated in a memorandum entitled *Literature Survey of Polymer Toxicity for Construction General Permit (CGP) Work Group* (Office of Research & Development, November 2011), which is available in the docket for the final permit.

In addition to the public comments and the Agency's aquatic toxicity research, EPA also considered approaches that state permitting programs have taken to regulate cationic treatment chemicals. While states differ in the way their permits or related standards or guidance documents regulate these chemicals, EPA has found that where

[1] Cationic treatment chemicals are polymers, flocculants, or other chemicals that contain an overall positive charge. Among other things, they are used to reduce turbidity in stormwater discharges by chemically bonding to the overall negative charge of suspended silts and other soil materials and causing them to bind together and settle out. Common examples of cationic treatment chemicals are chitosan and cationic PAM.

cationic chemicals are specifically addressed, the use of these chemicals is heavily regulated. In these states, the use of cationic treatment chemicals is either prohibited outright or subject to controls that other chemicals are not. These considerations have led EPA to the conclusion that use of cationic treatment chemicals at construction sites requires additional safeguards of the type that are generally included in the individual permit process. However, in recognition of the fact that some operators have successfully used cationic treatment chemicals to achieve significant reductions in sediment discharges and protection of water quality, EPA is open to such operators providing to their Regional EPA Office, in advance of submitting their NOI to EPA, an explanation of the controls and safeguards they will employ to ensure that use of such chemicals does not lead to toxic effects to aquatic organisms in the receiving waters. See discussion below regarding the type of information that will be relevant to EPA's evaluation of any requests to use cationic treatment chemicals. EPA emphasizes that the burden is on the operator to develop such controls and present them to the Regional EPA Office for consideration. EPA will review this information and evaluate whether it believes that such controls are sufficient to ensure that the use of cationic treatment chemicals will not result in a violation of water quality standards. EPA may determine that additional controls are necessary after such an evaluation, and the Agency may authorize the use of cationic chemicals under the permit subject to these additional controls. The Regional Office also may direct the operator to either not use cationic chemicals or seek coverage under an individual permit.

EPA's Rationale for Requiring Specific Authorization or Individual Permits for Cationic Treatment Chemicals

EPA took several factors into account in coming to the conclusion that the use of cationic treatment chemicals at regulated construction sites would be ineligible for coverage under the CGP, except in the circumstances described above. These include the following:

- EPA's anticipation in the C&D rule of specific polymers that may need to be approved on a case-by-case basis;
- The acute toxicity of cationic chemicals to aquatic species;
- Approaches taken by state NPDES permitting authorities;
- Feedback provided in public comments;
- Site-specific considerations necessary to determine proper dosage; and
- The effects of receiving water turbidity.

Each of these factors are discussed in detail below.

C&D Rule

EPA acknowledged in the C&D rule preamble that there may be some treatment chemicals that may require individualized review prior to their use on specific sites. For instance, in the context of discussing the importance of ensuring that polymers are properly used and to consider the appropriateness of using chemicals in areas where there are sensitive species, EPA stated "NPDES permitting authorities may establish controls on dosage and usage, protocols for residual toxicity testing, require prior approval before the use of particular polymers, training requirements for site operators or other measures they deem appropriate" (74 Fed. Reg. 63008). This statement points to the fact that EPA anticipated the need to potentially take additional precautions when

authorizing the use of some chemicals at permitted sites. These additional precautions include the possibility of requiring individual permits to review and approve the use of certain chemicals on a case-by-case basis.

Acute Toxicity

During the development of this final permit, EPA conducted further research into the relative toxicity of chemicals commonly used for treatment of construction stormwater discharges. This research was intended to supplement the aquatic toxicity data collected as part of the C&D rule promulgation, and to address comments received on the proposed CGP relating to toxicity. The research focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. For instance, one study found that after exposure to 0.75 ppm of acidified chitosan, 12 of 15 cultured rainbow trout died within 24 hours, while 6 of the 15 specimens died after exposure to 0.075 ppm. See Bullock et. al., *Toxicity of Acidified Chitosan for Cultured Rainbow Trout*, Aquaculture, Vol. 185 (2000), p. 273-280. In the same study, the lowest observed effect to rainbow trout was found at 0.038 ppm.

The lethality in fish species results when the positive charge of the cationic chemical binds to the negative charge of the fish gills. The adhesion of the cationic chemical to the gills interferes with oxygen uptake resulting in suffocation. The Agricultural Research Service (ARS), which has conducted significant research into the use of PAM for use in soil conservation, makes the following conclusions about cationic PAM:

> "It is important to emphasize the need to use anionic PAMs in these applications. Neutral PAMs and especially cationic PAMs have been shown to have LC_{50}s low enough for concern to certain aquatic organisms, whereas anionic PAMs have not. Cationics are attracted to the hemoglobin in fish gills. Suffocation occurs when fish are placed in otherwise clean waters that contain low levels of cationic PAM." See *PAM Primer: A Brief History of PAM and PAM-Related Issues*, R.E. Sojka and R.D. Lentz, http://www.ars.usda.gov/Research/docs.htm?docid=18876.

In comparison to cationic chemicals, the use of non-oil based PAM has shown minimal toxicity even at 10 times the normal erosion control concentration, 10 ppm. See Weston et. al., *Toxicity of Anionic Polyacrylamide Formulations When Used for Erosion Control in Agriculture*, Journal of Environmental Quality, Vol. 38 (2009), p. 238-247. Refer to EPA's Office of Research & Development memorandum entitled *Survey of Polymer Toxicity for Construction General Permit (CGP) Work Group* (November 2011), which is downloadable from the docket for this permit.

State Permitting Programs

Where state permitting programs have specifically addressed cationic treatment chemicals, they have either prohibited their use outright (or advised against their use) or required that they be subject to controls that other chemicals are not. The following is a summary of approaches found in various state permitting documents regarding the use of cationic treatment chemicals:

State	Document	Requirement
California	CGP	Provides coverage under the general permit for Active Treatment Systems (ATS) which employ cationic chemicals. Permit requires permittee to conduct jar tests to determine proper chemical and dosage level, to meet a 10 NTU turbidity limit, and to conduct residual testing or toxicity testing in some cases.
Michigan	Technical Guidance for Use of PAM for Soil Erosion Control	Identifies only anionic PAM as being non-toxic.
Mississippi	CGP	Prohibits use of cationic chemicals.
New Hampshire	State regulations (Env-Wq 1506.12(f)(5))	Chemical flocculants required to be anionic.
Virginia	Erosion and Sediment Control Bulletin	Advises against use of cationic chemicals.
Washington	Technology Assessment Protocol – Ecology (TAPE Program)	Use of chemical flocculants required to be reviewed and approved under TAPE program. TAPE authorizes use of chitosan-enhanced sand infiltration, which requires permittees to meet maximum dosage requirements, to conduct regular jar tests to adjust dosage levels, to monitor influent and effluent for pH, turbidity, and flow, and to potentially conduct residual or aquatic testing.
Wisconsin	Construction Site Erosion & Sediment Control Tech. Standards (150)	Prohibits use of cationic chemicals.

The new BNB project is not using sand filtration

~~EPA also notes that one Federal agency, the Natural Resources Conservation Service (NRCS), advises that PAM not be cationic. See NRCS Conservation Practice Standard (Code 450), Anionic PAM Application, downloadable at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026468.pdf and ARS' *PAM Primer, A Brief History of PAM and PAM-Related Issues* ("The specific PAM copolymer formulation should be anionic **(NOT cationic)**"), available at http://www.ars.usda.gov/Research/docs.htm?docid=18876.~~

Feedback ~~from~~ Public Comments

For the proposed CGP, EPA requested comment on a draft provision prohibiting the discharge of cationic polymers, except for chitosan, and whether the permit should include a maximum dosage level and residual testing requirements for chitosan. EPA heard from a number of commenters about their concerns with the use of chemicals in general. The following is a summary of some of the noteworthy comments EPA received:

- "Using a chemical (even a naturally occurring one) in a water treatment plant is far different than in a construction site. At the construction site, the water flow is highly variable, and even if the operator is sufficiently trained, there is a temptation to use more than necessary since the object is to keep the turbidity below permitted

release values. If not enough earns you a citation for too much turbidity, and too much earns you one for toxicity/fish kills, this approach may be more problematic than problem solving." Maryland Builders Association.

- "Allowable chemical treatment alternatives should be limited to those that are able to show zero or very low toxicity to fish and other aquatic life rather than requiring residual testing. Chemicals can do a great job in helping precipitate fine soils but if we are using toxic chemicals to assist in that effort, the risk to the environment would be less if we just capture the sediment that we can through strictly mechanical means and let the rest go." ETI Corporation.
- "Residual testing for polymers and dosage rates should be included in the Permit. EPA should include maximum dosage rates to prevent over application. Typically, construction workers or operators are not trained in the harmful effects of these substances on aquatic organism and over application may occur. The use of polymers, while providing a good sediment control system, must be monitored closely to reduce or eliminate the possible added pollution and environmental degradation it would cause if excess amounts are released into a receiving stream. It appears that EPA does not have enough data to determine what level of certain polymers (i.e. Chitosan) in the discharge can have an impact on plants and benthic organisms. Therefore, EPA should provide funding for the monitoring of the effects of polymers (i.e., Chitosan) on aquatic organisms." North Carolina Department of the Environment.
- "From an environmental perspective, the use of chemicals such as flocculants and polymers poses a risk to the environment and human health if used improperly. If chemicals are to be used for enhanced sediment removal, then an additional permit and residual testing should be required. Optionally, the operator could supply credentials such as training in the use of these chemicals and give a reason that the chemicals will be better suited for the treatment of the wastewater to warrant their use." Maryland Association of Industrial and Office Properties.

EPA also received comments that supported a more site-specific permitting approach to approving the use of treatment chemicals. The following are excerpts from these comments:

- "EPA should clarify this section to either allow chemical treatment on a site specific basis or provide exemptions if a site will otherwise be required to use chemicals to meet a specific requirement." National Association of Homebuilders.
- "… the levels of acceptable chitosan residuals should be established specific to the receiving water. There are many receiving waters where it is likely that low level chitosan residuals would present little or no likely harm to the environment." Leading Builders of America.
- "Attempting to dictate a specific dosing or maximum dosing given uniqueness of each project and application would be difficult. Suggest that operator should be required to follow manufacturer recommendations and that the permit not specify any specific or maximum dosage." City of Meridian.

Although the focus of these comments was not on the use of cationic treatment chemicals alone, they suggest that where the Agency finds there to be risks associated with chemicals released into the environment, the Agency should carefully consider what permitting approach would work best considering the potential toxicity and the types of sites being regulated.

Site-Specific Dosage Considerations

To manage the toxicity of cationic treatment chemicals and to avoid overapplication, agencies have recognized the importance of establishing maximum dosage rates and, in some instances, to require these rates to be adjusted where significant variables, such as soil type, flow rate, and turbidity change during construction. The following are some examples of how state agencies have incorporated dosage considerations in the regulation of cationic treatment chemicals:

- California CGP: Concerning treatment requirements for active treatment systems (ATS), which use cationic polymers, "1. Jar tests shall be conducted using water samples selected to represent typical site conditions and in accordance with ASTM D2035-08 (2003). 2. The discharger shall conduct, at minimum, six site-specific jar tests (per polymer with one test serving as a control) for each project to determine the proper polymer and dosage levels for their ATS. 3. Single field jar tests may also be conducted during a project if conditions warrant, for example if construction activities disturb changing types of soils, which consequently cause change in storm water and runoff characteristics." (CA CGP, Attachment F, D.1-3, http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo_2009_0009_att_f.pdf)
- Washington, Requirements for Chitosan-Enhanced Sand Infiltration Technologies: "The chitosan dose rate for water entering the filters shall not exceed 1 mg/L StormKlear™ LiquiFloc™ (as chitosan by weight). All calibration results must be recorded simultaneously with the flowrates and kept on site. … Jar tests will be conducted at startup to determine the dosage level of chitosan acetate solution. Additional jar tests will be conducted when influent turbidity changes by 20% or greater. Jar test results must be recorded in the daily operating log. If the results of the jar test indicate that the dose needs to be adjusted, the jar testing results and the indicated dose rate change shall be documented in the daily operating log." (WA Department of Ecology, *Use Designations Erosion and Sediment Control for Chitosan-Enhanced Sand Filtration Using StormKlear™ LiquiFloc™, January 2008,* http://www.ecy.wa.gov/programs/wq/stormwater/newtech/use_designations/LiquiFlocGUD012208.pdf)
- Wisconsin, Standards for Polymer Use: "Maximum application rates, per storm event, in pounds per acre-feet shall be the lesser of WDNR's use restriction multiplied by 1.35 or the manufacturer's recommended application rate (1.35 is a conversion factor that is used to change the use restriction from ppm to an application rate in pounds per acre-feet)." (WI Department of Natural Resources, Conservation Practice Standard, Interim Sediment Control – Water Application of Polymers (1051), Section VI.C, http://dnr.wi.gov/runoff/pdf/stormwater/techstds/erosion/dnr1050-polyacrylimide.pdf)

This suggests to EPA the need to examine the use of chemicals on a case-by-case basis to ensure that dosage is appropriately considered. EPA recommends that operators who wish to use cationic treatment chemicals consider the dosing and other technical requirements of a state agency that would be most applicable to their discharge as they prepare their site-specific control plans for consideration by the applicable EPA Regional Office. Alternately, they may use other technical publications, manufacturers specifications, and their own prior experience with the use of such chemicals, as appropriate.

Effects of Receiving Water Turbidity

There is a strong electrostatic attraction between cationic polymers and the negative ionic charge of sediment particles that are suspended in the water column. Where free cationic chemical is discharged to surface waters that are relatively turbid (e.g., 1000 NTU), the sediment provides a buffer against the residual chemical.

(According to the Agricultural Research Service, when PAMs are introduced into waters containing sediments, humic acids, or other impurities, the effects of PAMs on biota are greatly buffered. *See PAM Primer, A Brief History of PAM and PAM-Related Issues* available at http://www.ars.usda.gov/Research/docs.htm?docid=18876.)

Once the cationic polymer binds to the sediment particles, they would be expected to stay bound, making them unavailable for binding to fish gills. In the same way, if residual chemical is discharged to a relatively non-turbid waters (e.g., 5 NTU), then the risk to fish species in the receiving water is higher due to the lack of buffering effect of sediment. Therefore, the level of turbidity in the receiving water, provides another site-specific variable that can be taken into account when evaluating the relative risk to aquatic species of using cationic treatment chemicals. However, because turbidity will vary from stream to stream, any consideration of turbidity in permitting cationic treatment chemicals will necessarily need to be on a case-by-case basis.

EPA believes that, at this time, the use of cationic chemicals at regulated construction sites, given their aquatic toxicity and the need to take into account site-specific factors to ensure proper use, requires a case-by-case type of permitting approach. It is for these reasons that EPA has decided to require individual permits or case-by-case authorization for sites that elect to use such chemicals.

Relevant Information to be Considered by EPA for Individual Requests for Authorization to Use Cationic Treatment Chemicals

EPA will need to individually evaluate requests by operators to be authorized under this permit to use cationic treatment chemicals. The operator should contact their applicable EPA Regional Office to determine what specific information they require to properly evaluate each individual request. As a general matter, some of the information that may be pertinent to this evaluation includes, but is not limited to, the following:

- **Soil types present at your site.** A list of the soil types likely to be exposed during construction in the areas of the project that will drain to chemical treatment systems that utilize cationic chemicals. Also, a listing of soil types expected to be found in fill material to be used in these areas, to the extent this information is available prior to construction.
- **Background conditions.** Data that describes background pH and turbidity found in surface waters at the point of discharge from locations on your site that will utilize cationic treatment chemicals. Background levels are be based on the levels found in the receiving water during dry weather conditions. Qualifying data for determining background levels of pH and turbidity includes information from a peer-reviewed publication or a local, state, or federal government publication, or the results of samples you collect yourself of ambient pH and turbidity levels in the receiving water during dry weather conditions.
- **Basis for use of cationic treatment chemical.** An explanation of why the use of cationic treatment chemical is necessary at the site *(e.g., necessary to meet a specific water quality criterion for turbidity);* and information to support why the particular chemicals chosen are appropriate for use in light of the specific soils present at your site and the background levels of pH and turbidity.
- **Specific chemical information.** The following information related to each of the cationic chemicals that will be used at the site:
  - A listing of all cationic treatment chemicals to be used at your site;
  - Copies of Material Safety Data Sheets (MSDS) for each cationic chemical listed in (a), above;
  - Toxicity data for each cationic chemical. This includes data provided by the supplier/provider of the chemical to be used;

- Jar test results for each cationic chemical; and
- Manufacturer specifications regarding the use or recommended dosage levels of each cationic chemical.

- **Site plan.** Supplementary information on the SWPPP site map related to your use of cationic treatment chemicals, such as:
  - Locations where cationic treatment chemicals will be applied and stored on site; and
  - Distance between these locations, and points of discharge.
- **Schematic drawings.** Schematic drawings showing the design of the chemical treatment systems *(e.g., chitosan-enhanced sand infiltration system, passive treatment systems)* to be used at the site.
- **Responsible personnel.** A list of personnel who will be responsible for operating the chemical treatment systems, application of the chemicals, and for compliance with any permit requirements specific to the use of cationic treatment chemicals.

EPA does not anticipate that providing such information to the EPA Regional Office in advance of NOI submission will entail significant burden, since operators would generally need to include such information in their SWPPP or other documentation in any case.

VI.3 Types of Discharges Authorized Under the CGP (Part 1.3)

Part 1.3 lists categories of stormwater discharges that are allowed under the CGP, provided that all applicable permit limits and conditions are met. This list includes the following discharges:

1. Stormwater discharges, including stormwater runoff, snowmelt runoff, and surface runoff and drainage, associated with construction activity;
2. Stormwater discharges designated by EPA as needing a permit under 40 CFR § 122.26(a)(1)(v) or § 122.26(b)(15)(ii);
3. Stormwater discharges from construction support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided;
   a. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
   b. The support activity is not a commercial operation, nor does it serve multiple unrelated construction projects;
   c. The support activity does not continue to operate beyond the completion of the construction activity at the project it supports; and
   d. Stormwater controls are implemented in accordance with Part 2 and, if applicable, Part 3, for discharges from the support activity areas.
4. The following non-stormwater discharges from your construction activity, provided that, with the exception of water used to control dust and to irrigate areas to be vegetatively stabilized, these discharges are not routed to areas of exposed soil on the site and the permittee complies with any applicable requirements for these discharges in Part 2:
   a. Discharges from emergency fire-fighting activities;
   b. Fire hydrant flushings;
   c. Landscape irrigation;