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**1.0 Purpose**

The purpose of this Penn State *Water Incursion Response Plan* (WIRP) *and Standard Operating Procedures* is to provide necessary information to support Penn State response to water incursion events, and to prevent or contain the growth of mold in applicable Penn State facilities.

Though the purpose of this WIRP is to address mold on a basic level, mold response actions are separately addressed in the *Penn State Mold Response Guidelines* document, as further referenced.

**2.0 Introduction**

The most effective means to prevent damage to building materials, resulting losses, and unacceptable health risk to building occupants from water incursion, is to stop or control the source of uncontrolled water as quickly as possible, followed by efficient water extraction, drying, cleaning, and/or removal of affected materials, preferably within 24 – 48 hours. Under certain conditions leaks may not be immediately detected (seepage through building envelope, or groundwater build-up and infiltration); however, once identified, measures should be taken to monitor or limit impact until more thorough investigation or mitigation can be conducted. In all cases, quick response is important to successful response.

**2.1 Sources of Water Incursion**

Water incursion into Penn State buildings and occupancies may occur through many different sources including, but not limited to:

* Pipe or pump/equipment leaks (domestic, HVAC, fire water),
* building envelope rainwater penetrations through broken or displaced joints, mortar caulk,
* roof leaks (ice dams, etc.),
* groundwater infiltration (from drain b,
* sewage leaks,
* interior high humidity levels/ condensation,
* process chilled water leaks (heat transfer system leaks), and
* other sources (interior water features, aquariums, etc.).

Types of source water are further defined and classified at Section 5.3 of this WIRP. The appropriate response to water incursion events depends on the type of source water, and the relative level of impact, as further presented.

**2.2 Effective Response**

Effective, timely response to water incursion events is also dependent upon: effective communication, recognized responsibilities, and readily available resources to properly resolve a water incursion event. These items are further discussed in this WIRP.

**3.0 Applicability**

This *Water Incursion Response Plan & Standard Operating Procedures (WIRP)* shall be applicable to all Penn State facilities except Penn State Hershey Medical Center and College of Medicine, and Pennsylvania College of Technology facilities. Penn State Contractors and 3rd Party Representatives are referred to in this WIRP for guidance and clarifications during response to water incursion events.

**4.0 Responsibilities**

**4.1 University Park Office of Physical Plant (OPP) Senior Management, Commonwealth Campus Chancellors and Directors of Business Services (DBS’s) and Finance Directors, Auxiliary & Business Services (ABS)/Housing & Food Services (HFS) Directors, and other Penn State Work Unit Senior Managers**

Ensure budgetary allocation and timely release of funds to support necessary water incursion response actions, and provide necessary support to ensure timely response by critical parties and stakeholders.

**4.2 OPP Work Planning and Commonwealth Services, ABS/HFS Directors & Assistant Directors, and other Penn State Work Unit Director-Level Management**

Identify and engage appropriate response resources and services (OPP, other Penn State, and external contractors) and as pertinent, coordinate the response action planning and delivery, and ensure implementation of the necessary procedures and communications supporting the response action.

**4.3 OPP Area Services, Central Services and other Unit Supervisors, Penn State Work Unit Facilities Coordinators, Commonwealth Campus DBS’s /Maintenance Supervisors, and other Penn State Work Unit Supervisors:**

In communication with OPP Work Planning and Commonwealth Services and other pertinent Business Directors, ensure coordination of localized response parties at the work sites, and take necessary actions to support the containment of water damage, uncontrolled mold growth, and the health and safety of facility occupants.

**4.4 OPP, Penn State Work Unit and Commonwealth Campus Support Organizations (e.g. Waste Water Treatment Plants, Technical Services, Engineering Services, Specialized Trades, etc.)**

Be knowledgeable of this WIRP and other pertinent response procedures, and be prepared to provide timely expertise and support to coordinating Penn State organizations (e.g. equipment/manpower/operational, technical, or information and public relations), as needed to limit and contain the impact of water incursion events.

**4.5 Penn State OPP/ Environmental Health & Safety**

4.5.1 Develop, review and revise this WIRP/SOP’s document, in coordination with other Safety Officers and work unit personnel supporting ongoing effectiveness.

4.5.2 Provide necessary technical support prior to, during and following water incursion events, to ensure the health and safety of building occupants. EHS may recommend or clarify appropriate courses of action, provide instruction on remediating the problem, dealing with employee concerns regarding their health and safety, and arrange or support any pertinent pre- and post-cleaning testing or project site consulting and monitoring to verify the effectiveness of the response measures.

4.5.3 Define appropriate external contractors and consultants needed to support this WIRP, and assist OPP, Commonwealth Services and Campus DBS’s and Safety Officers (SO’s) to engage necessary services and receive needed documentation.

**4.6 Penn State Risk Management**

Penn State Risk Management is responsible to provide direction and clarification on claims or insurance policy and procedures related to water incursion events. Risk Management should be consulted as early as possible to clarify any questions related to water incursion events.

**4.7 Work Unit Safety Officers and Safety Liaisons**

Work closely with Penn State EHS, OPP, and other work unit management and operational personnel, to support the most effective means of implementing this WIRP and associated Standard Operating Procedures supporting the health and safety of building occupants.

**4.8 Other Penn State Management Organizations**

 Depending on incident severity or conditions, other organizations such as Penn State Emergency Management, Public Affairs, Strategic Communications, and General Counsel may need to be engaged. Consult Penn State EHS for support and clarification related to Category III incidents.

**4.9 External Response Contractors and 3rd Party Monitoring Support Firms**

4.9.1 Provide timely response in accordance with Penn State contract requirements for supporting the resolution of water incursion events at Penn State facilities.

4.9.2 Work cooperatively with Penn State and other external contractors and 3rd Party Monitoring firms to provide timely, effective resolution of water incursion events.

4.9.3 Provide all necessary documentation in a timely manner, and in accordance with defined scopes of work supporting completion of water incursion events.

**5.0 Terms & Definitions**

**5.1 Water Incursion**

 Any entry of water into a building in a manner that affects building materials or contents, and/or may promote mold growth. Incursion events can be sudden/evident (e.g. sprinkler or pipe leak), or occur over a long period with increasingly noticeable damage (e.g. window leak, foundation seepage to interior walls, etc.).

**5.2 Water Classifications**

5.2.1 “Clean/ Potable Water” – Potable (drinking or domestic) water originates from a clean source that does not contain microbial content. Clean/treated or potable water represents the least worrisome type of water incursion, and if quickly cleaned and dried up, represents a low risk for resulting microbial growth. Examples include: potable water pipe leaks, appliance leaks, sink overflows, broken toilet bowls or tanks with “clean” water.

5.2.2 “Gray Water” – Gray water includes environmental water that has infiltrated a building during flooding, or ground water that has seeped through foundation walls or other building materials. Massive flooding may include some sewage contamination. Gray water may also include potable water that has stagnated in pipes (e.g. sprinkler lines) and discharged into the building. Gray water contains microbial contaminants and may cause illness or discomfort if accidentally consumed. Additional examples include: untreated aquarium water, overflow from washing machines and dishwashers, other sources of environmental water or water that has flowed across or through building materials. Clean-up of gray water requires some level of personal protection and controls.

5.2.3 “Black Water” – Black water is typically sewage, or water that has contacted feces, food sources, or been retained in an area over a long period of time, and is highly contaminated with microbial contaminants, including pathogenic organisms. Clean-up requires specialized personal protection and controls.

5.2.4 “Industrial Water” – Industrial water constitutes water that has discharged from processes that are chemically-treated (e.g. boilers, heat exchangers, chilled water or specialized equipment) which has been treated with ethylene or propylene glycol, other pH adjustors or de-oxidizers, etc. Discharge and drainage of industrial water is specifically governed by requirements of the Penn State Stormwater Management Program, and the applicable Waste Water Treatment Plant authorities. Please refer to the OPP website for Penn State Stormwater Publications and Training Documents, and particularly to the document: [Stormwater Management Information Regarding Illicit Discharges](https://opp.psu.edu/sites/opp/files/illicit-discharge.pdf) for further information. Industrial water clean-up may require certain controls and PPE.

**5.3 Water Sources**

5.3.1 Fire System/Sprinkler Water – Potable water that becomes stagnant (gray) from sitting in pipes, and may contain microbial growth. Other potable water plumbing leaks may be similar if not attended.

5.3.2 Condensation – Condensed, clean water from humid air in contact with cold surfaces. Dripping or draining condensate can then be absorbed into building materials. Clean condensate water, once absorbed or passing through materials becomes “gray water”, and may contain or support microbial growth. Condensation is often associated with uninsulated chilled water pipes, heating, ventilating, and air-conditioning (HVAC) system cooling coils, HVAC supply diffusers (during air-conditioning), or cold room surfaces (high relative humidity with air-conditioned air moving across room surfaces. Condensation most often occurs during summer when relative humidity levels are high. Condensation on HVAC supply diffusers or nearby cooled ceilings/tile, can result in highly visible dust or particulate streaking on the damp surfaces. This may appear as black streaks or patches, or may contain mold growth. High humidity and condensation (with no air exchange), can result in particulate build-up and mold growth on furniture and other room surfaces in occupancies closed during non-use periods.

5.3.3 Closed-Loop Heating/ Process Chilled Water Systems – Industrial water from closed-loop heating systems presents a unique challenge due to the additives (rust inhibitors, treatment agents, and antifreeze) in the water. Industrial water may have relatively low human toxicity, but may have strong, disagreeable odors, may be toxic to wildlife or the environment, and may contain elevated microbial growth. Industrial water d*ischarge/leaks, and disposal to facility drain sare governed by Penn State OPP Stormwater Program requirements, or applicable Waste Water Treatment Plant requirements. Contact OPP/Larry Fennessey (814-863-8743), or Dave Swisher/ University Park WWTP (814-867-6123) for direction or clarifications.*

5.3.4 Rainwater/ Building or Roof Leaks/Ice Dams – Rain water infiltration from roof leaks or other structural defects is one of the most common types of water incursion, and generally constitutes a gray water source. Though relatively clean, rainwater picks up impurities as it flows through a building structure. If water is collected promptly, additional cleaning is often limited or not required. **Building materials may contain hazardous or regulated agents such as asbestos, lead or PCB’s.** **Response actions involving water-damaged insulations and building materials must be conducted after appropriate communication with EHS to ensure proper management.** **Rainwater may carry asbestos into the building, necessitating cleanup by licensed asbestos abatement contractors. Refer to Section 5.4 for further clarifications.**

5.3.5 Groundwater Infiltration – Ground water infiltration (gray water) often contains organic load, and can be related to soil saturation during heavy rains, or building rainwater drain system plugs or back-ups. Water incursion into the building is often caused by flaws in the foundation (cracked block, improper sealing, or broken/missing mortar joints). Groundwater infiltration may be related to cracked or broken roof or window well drains, or improperly-sealed foundation wall penetrations (plumbing electrical conduit, etc.). Ground water infiltration may be caused by improper exterior landscape grading, subgrade material construction, or uncontrolled stormwater discharge. This most often appears in basement occupancies and may appear as flooding in basement level elevator pits. Control of groundwater may require excavation around the exterior of building to positively identify the source of the problem.

5.3.6 Water Vapor Migration through Concrete Floors – Under increased groundwater load, water vapor may migrate through improperly sealed concrete floors or walls without proper vapor barriers installed.

5.3.7 HVAC System Malfunctions – Varied HVAC system malfunctions may result in water incursion:

* Loss of chilled water service – increased humidity,
* Leaking steam or hot water – absorption of potable/gray water in building materials,
* Plugged HVAC condensate drain pans or lines – spillage and absorption of gray water
* Poorly insulated chilled water lines – condensation/dripping water into insulation with subsequent mold growth,
* High uncontrolled humidity in air-conditioned spaces – condensation on supply diffusers, ceiling tile, and cold surfaces with resulting dust build-up or mold growth.

NOTE: As indoor relative humidity levels reach or exceed 65% for any significant period of time, mold growth is likely to occur. System repairs should be a top priority.

5.3.8 Sewage – Releases of sewage (“black water”) represent the most challenging type of water incursion incident. Sewage should be considered potentially infectious, and persons conducting clean-up of sewage should have the proper training, (possible vaccinations), personal protective equipment, collection equipment (vacuum trucks), and use effective disinfectants (see below). The amount of organic matter present, along with the odors and unsanitary aspects of sewage necessitate that additional measures be taken to ensure proper clean-up. In unoccupied areas (such as crawl spaces) or outdoors, the spill should be treated with lime (calcium oxide). Solids should be collected and disposed of. Indoors, clean-up of sewage releases should begin with the removal and disposal of as much solid material as possible. Liquid waste can be mopped up or wet-vacuumed and disposed of in a toilet. Contaminated articles should be bagged in durable plastic bags, and disposed in trash/residual waste receptacles. The affected area should then be thoroughly cleaned with an appropriate disinfectant such as: Virex 64 or QuatStat 5 (Betco). Sewage-impacted areas should not be occupied (normal building occupancy) until clean-up efforts are completed.

 Clean-up of large quantities of sewage may be supported by the University Park Waste Water Treatment Plant, or other Campus WWTP’s or contracted services; however, major sewage leaks are most often cleaned up by external contractors. Contact EHS for questions or assistance. **Contact the OPP Work Reception Center (5-4731) for pertinent listed contractors under the Job Order Contract (JOC).**

**5.4 Remedial Measures or Clean-Up**

Remedial measures may include removal of wet building materials or contents that have been impacted by water, with some limited mold growth present. Porous materials that cannot be cleaned or restored must be discarded to prevent significant mold growth, and to protect personnel and building occupants.

Mold remediation is further addressed in the Penn State EHS document: *Mold Response Guidelines – Mold Clean-Up and Small-Scale Removal of Mold-Contaminated Materials.*

**CAUTION: Contact OPP Work Reception, the applicable Campus Maintenance Office, and/or EHS before disturbing plaster or drywall, other insulation materials, cove base or other suspect Asbestos-Containing Building Materials, lead-containing paints, or PCB’s. Without EHS clarification, all such materials must be sampled/analyzed to determine if hazardous, and/or removed by a licensed and pre-qualified Asbestos Abatement Contractor, or other qualified contractor, prior to material disturbance as part of the incident response.**

**6.0 Response Measures**

**6.1 Drying Principles**

6.1.1 Excess Water Removal

* Excess water should be removed at the beginning of the restoration procedures. Typical equipment used may include pumps and wet/dry shop vacuums.
* Potable or gray water should be discharged out-of-doors, or to sanitary drains.
* Sewage (black) water should be collected for discharge to waste treatment plant, or returned to toilet.
* Industrial water shall be collected, and the volume of loss estimated. Following approval by EHS, and in careful communication with the applicable Waste Water Treatment Plant (WWTP) authority, the collected water may be discharged to sanitary sewer. The source location will determine whether the discharge is permissible and is discharged to the applicable Penn State WWTP, or other WWTP.

 **All other aspects of industrial water discharge and disposal shall conform with the** [**Penn State OPP Stormwater Program**](https://opp.psu.edu/penn-state-stormwater-publications-and-training-documents) **requirements. Refer to Section 14 for further information.**

6.1.2 Evaporation

Once excess water is removed; remaining water must be evaporated (liquid to vapor) using air-moving equipment. Air movement across wet surfaces accomplishes evaporation. Effective evaporation will expedite subsequent dehumidification.

6.1.3 Dehumidification

As moisture is evaporated from building materials and contents, it must be removed from air by dehumidification. Failure to dehumidify air may result in secondary damage due to resulting mold growth and subsequent health risk to building occupants. High capacity dehumidifiers that remove a significant percentage of water from the air (*low grain refrigerant, or LGR units*) are frequently required to remove this moisture from the air. Dehumidification during dry winter conditions can be effective by exchanging damp, indoor air with outdoor air, and subsequent indoor heating of air within the space.

6.1.4 Temperature Control

Both evaporation and dehumidification can be greatly enhanced by controlling temperature in the environment being dried. Thus, temperature modification and control is an important principle to effective drying. The building HVAC system or auxiliary heaters can be used to increase temperature for evaporation; however, the following precautions should be observed:

* + Follow proper safety practices related to electrical power supplies, and exhaust venting.
	+ Do not cause an excessive temperature increase (e.g., >80°F) as this may accelerate mold growth.

**6.2 Relative Categories of Water Impact**

Water-damaged or impacted environments can generally be classified for purposes of determining response actions according to the amount or type of water involved, the types and size of impacted materials, and the level of difficulty in drying materials. The following categories are not strict classifications but provide a framework for determining the necessary resources, operations, and communications supporting effective response. **Refer to the Response Matrix at Section 7.0 for information regarding response measures.** Sewage or black water has unique considerations. Refer to the separate Source Water Type guide for Sewage at Section 7.0.

6.2.1 Category I – Minor Impact

 **Minor quantity of water present. Estimated up to 100 gallons.** Relatively small amount of water discharged (e.g. sprinkler discharge for 3 – 5 minutes, slow pipe leak with limited impact, other detected potable water leak with prompt control of leak. Small number of rooms or spaces affected (e.g. 1-3 rooms). Minimal carpet impact (portions of rooms or a single room), with proper extraction and drying within 24 hours. Limited water wicking in walls to distance less than 1 foot above floor level (1’ AFL) (guideline). Environmental water influx minor. No carpet pad present.

6.2.2 Category II – Moderate Impact

 **Moderate quantity of water present. Estimated to exceed 100 gallons, and up to 2,000 gallons.** Moderate amount of water discharged (e.g. sprinkler discharge or pipe leak with a lagging response time (e.g. several minutes – 1 hour). Several rooms affected, and/or multiple floors affected. Water wicking up walls in several rooms, and/or to a distance exceeding 1’ AFL (guideline). Carpeting affected in more than one room or with soaked padding. Water noticeable in structural materials (structural wood, plywood subfloor or deck), concrete slab soaking indicated. Environmental water influx or flooding into more than one area with some limited impacted to carpet and walls.

6.2.3 Category III – Significant Impact

 **Significant quantity of water present. Estimated to exceed 2,000 gallons.** Significant quantity of water discharged (e.g. sprinkler or pipe discharge, with significant lagging response time (> 1 hour – several hours). Several rooms, multiple floors and/or several wings affected. Multiple types of spaces impacted. Water wicking up walls in several or many impacted rooms, and/or to a distance exceeding 1’ AFL. Wetted ceiling area duct insulation or pipe insulation in several locations or for extended distance of ductwork and/or insulated pipe. Saturated materials or standing water in several rooms or areas. May involve environmental flooding into multiple spaces with significant impact (several surfaces or types of material impacted).

6.2.4 Category III Notation

 Materials that have experienced significant impact, AND that involve materials that have been water-soaked over a longer duration (> 3 days), AND may be difficult or slow to dry without specialty drying equipment or procedures (e.g. lumber, hardwood, stone, concrete block), may require demolition or additional specialized drying and response measures. Consult EHS for assistance.

**7.0 Incident Response Process**

**7.1 Preliminary Caution – Asbestos & Hazardous Materials**

**Contact OPP Work Reception and/or EHS before disturbing plaster or drywall, other insulation materials, cove base or other suspect Asbestos-Containing Building Materials, and particularly buildings constructed prior to 1990. All such materials must be removed by an approved Asbestos Abatement Contractor prior to other material disturbance.**

**Similarly, consult EHS regarding any other indicated or possible hazards present (radiological, chemical, biological, electrical, etc.) for special action.**

Depending on the level or category of water incursion impact previously presented, different response measures are required, as subsequently presented.

**7.2 Immediate Response, Limited or Minor Impact (Category I)**

7.2.1 If the response is not delayed, and can be reported and responded to immediately,

 Call or report to the Work Reception Desk (5-4731), or pertinent Campus reporting line.

7.2.2 Engage Area Services or the pertinent OPP Central Services or corresponding Commonwealth Campus Maintenance, or 3rd Party Property Manager to shut off the leak, to investigate course of water flow and impact to other materials (insulation, drywall, contents); assist Custodial or other operations to move items or articles (supporting Custodial extraction or drying), remove wet duct (fiberglass) insulation, and open small sections of wet or soaked drywall to improve drying.

7.2.3 Engage pertinent OPP or Commonwealth Custodial Operations in coordination with above parties to extract excess water from carpet, dry affected carpet with fans, open sections of wet or soaked drywall to support drying, and initiate dehumidification.

 **CAUTION: Refer to 7.1 for Preliminary Caution regarding asbestos and other potential hazards.**

7.2.4 Contact OPP Work Planning or Campus Maintenance to support more effective work coordination if response cannot be completed within one work shift.

7.2.5 Contact/notify EHS of status, and if further site support is needed.

7.2.6 If environmental water due to flooding is more than “Category I”, refer to Delayed Response protocol.

**7.3 Delayed Response, Limited or Moderate Impact (Categories I, II)**

If the response is delayed beyond 1 hour, or if category II environmental water is involved, observe the following procedure:

7.3.1 Call or report incident to the Work Reception Desk (5-4731), Campus Maintenance, or 3rd Party Manager. Provide any known context of the water incursion findings.

7.3.2 Depending on time of event, and availability of services, University Park Work Reception dispatch OPP Area Services, Central Services and OPP Work Planning to the site. Campus Maintenance, Security, or 3rd Party Property Manager may dispatch appropriate responder(s) for initial incident assessment.

7.3.3 OPP Area, Central and/or Work Planning (or pertinent Campus Maintenance organization) de-energize any vulnerable electrical service and identify and control the leak/incursion, and further review/evaluate the site conditions (determine course of water flow, and assess extent of water impact to building areas and materials).

7.3.4 As feasible, perform any needed immediate control of the leak or water influx (stop water flow and/or placing appropriate barriers or pumps to collect/control water flow) OPP Services and Work Planning.

7.3.5 Following incident stabilization, engage OPP (or Campus) Custodial to extract, dry, and dehumidify affected areas.

7.3.6 OPP/Campus Maintenance in coordination with Work Planning or Commonwealth Services, and with support by Penn State EHS, remove wet duct or pipe insulation, and/or create small wall openings (drywall) to support subsequent Custodial or external contractor drying and dehumidification (if potable water).

**CAUTION: Refer to 7.1 for Preliminary Caution regarding asbestos and other potential hazards.**

7.3.7 For moderate environmental water flooding and/or moderate-significant impact requiring materials removal, OPP/Commonwealth Services or Campus Maintenance engage pertinent defined external services to support immediate control needs. Refer to Section 6.2 for clarification.

7.3.8 Contact Penn State University Park EHS (5-6391) or the pertinent Regional EHS Coordinator for support in determining further needed scope of operations. Similarly notify the pertinent Safety Officer.

 NOTE: 3rd Party Monitoring Support to assess, control, or prevent mold growth may be advised for work involving significant material removal, where necessary to isolate occupied areas from nearby unoccupied work zones, and work requiring several days for corrective action. Consult EHS for assistance in determination.

**7.4 Delayed Response, Significant Impact (Category III)**

If the response is significantly delayed (overnight), or if category II or III environmental water or sewage are involved, observe the following procedure (refer to Section 6.2 for clarification):

7.4.1 Call or report incident to the Work Reception Desk (5-4731), or pertinent Campus Maintenance, Police, or dispatching authority. Provide any known context of the water incursion findings.

7.4.2 Work Reception or Campus Maintenance, Police, or dispatching authority engage OPP Work Planning or Commonwealth Services in coordination with pertinent Technical Services to conduct initial site assessment utilizing the above 7.2 protocol for initial investigative steps. Contact Penn State EHS for additional support.

7.4.3 Where feasible, perform necessary stabilization measures to stop inflow of water. Where significant sewage or black water is involved, engage pertinent external contractors for immediate support.

7.4.4 Contact Penn State EHS and pertinent Safety Officer for support in determining next steps to establish contractor scopes of work, and to engage 3rd Party Monitoring Support Services, as needed to verify indoor air quality in occupied areas, and to assess, control, and/or prevent mold growth from occurring.

 NOTE: Such services are anticipated where significant materials removal is required in close proximity to occupied spaces over a significant period (e.g. several days).

**CAUTION: Refer to 7.1 for Preliminary Caution regarding asbestos and other potential hazards.**

7.4.5 Establish pertinent scopes of work, and pertinent report documentation by qualified contractors in coordination with Penn State EHS.

**7.5 Hidden Water Incursion Conditions (Categories I, II, III)**

There are occasions when the source(s) of water incursion cannot be immediately identified. The investigation may require several days to weeks before source(s) are identified and a plan for correction implemented.

**In such situations, routine action is needed to for protection of building occupants, and to minimize the impact of the water incursion. An initial plan may be required to create adequate isolation of occupants, or temporary relocation of occupants**.

Coordination and periodic communication is necessary among pertinent stakeholders and support groups (OPP Work Reception, Work Planning, Area or Central Services, Engineering Services, Utility Systems, Commonwealth Services, Campus DBS/Maintenance, ABS/ Housing & Food Services, Work Unit Management and Facilities/Safety, and Penn State EHS. Student-occupied facility incidents with significant impact necessitate engaging other management groups. Such groups include, but are not limited to: Strategic Communications, Public Affairs, Risk Management, General Counsel, etc.

7.5.1 Based on an initial assessment involving personnel from OPP, Work Unit or Campus Management, and EHS, determine anticipated sources of water incursion. As feasible, establish necessary OPP Work Orders or Campus planning to monitor and maintain conditions until the source(s) can be identified and corrected. OPP or Campus should coordinate with the work unit Facility Coordinator and EHS to determine any need for immediate occupant isolation or relocation.

7.5.2 Conduct regular (daily - weekly) monitoring of conditions, being on the lookout for a worsening situation.

7.5.3 Provide catch basins, diverters, or other such devices to prevent the spread of water. Ensure that a preventive maintenance/periodic work order is set up to ensure diverters/collectors are emptied regularly (again, possibly daily).

7.5.4 As noted at 7.4.2, provide local or source dehumidification to occupied areas. Where feasible, ensure this does not require occupant service of dehumidifiers. Dehumidification is critical to prevention of mold growth, and supports building system maintenance, and occupant health and comfort. Dehumidification criteria should follow industry-standard guidelines and practices. Consult EHS for assistance.

7.5.5 Promptly clean-up (extract/clean, dry, dehumidify) carpet, as necessary on a periodic basis. Ensure carpet is maintained dry to prevent mold growth! If groundwater incursion or seepage is an uncontrolled source, the affected room or space may necessarily remain unoccupied, if the carpet is subject to continual damp conditions. Remove carpet if required to maintain water clean-up/control.

 7.5.6 Remove/replace or repair building materials that have become wetted. Do NOT leave wall cavities open and visibly exposed, for extended periods, in occupied areas. Opening may be required for drying; however, temporary ventilated barriers may necessarily be set-up for water/seepage control and drying.

 **CAUTION: Refer to 7.1 for Preliminary Caution regarding asbestos and other potential hazards.**

7.5.7 Wetted or damp porous materials, such as ceiling tiles, should be discarded/replaced. If an ongoing wet condition is expected, install an absorbent layer (or moisture collector/diverter) that can be routinely changed or monitored, OR replace ceiling tile periodically until the source is identified and corrected.

 **NOTE:** Proper ceiling integrity (ceiling tile installed) is most often critical to proper ventilation within the occupied space. Ceiling tiles should not be removed without replacement for extended periods. Service personnel should be conscious of asbestos concerns as previously noted.

7.5.8 Proper ventilation and air filtration must be maintained, pertinent to OPP requirements for the affected space(s). Temporary measures may be required.

**8.0 Response Guide Matrix**

**8.1 Preliminary Matrix Guide** – Category limits are distinct for SEWAGE (refer to the Sewage Source Water Type).

**8.2 Matrix by Source Water Type**

| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 100 gallons)** | **Category II – Moderate Impact (Estimated 100 gallons – 2,000 gallons)** | **Category III – Significant Impact (Estimated to exceed 2,000 gallons)** | **OTHER NOTES** |
| --- | --- | --- | --- | --- |
| **Potable Pipe/ Sprinkler Leak** | Contact OPP Work Reception Desk (WRD) or Campus dispatch/reporting line; engage service to stop leak. Pre-Assess potential asbestos (floor tile, cove base adhesives, etc.) and hazardous building materials (HBM’s). Determine scope of impact (collectively “initial steps.”Initiate carpet/material extraction, drying, evaporation, dehumidification (cleaning). Replace stained ceiling tile (CT). Replace wet/soaked drywall at floor, unless opened/dried. Additional cleaning limited or not required, if started promptly (within 48 hours). Contact EHS for assistance. Completion: OPP or Campus/Contractor verification. | Same as Category I. Pre-Asbestos and HBM’s. Evaluate impact to structural materials (walls, ceilings) for water impact (high moisture content, bulging/ deformation; suspended ceiling insulation/contents). Remove/replace heavily damaged ceiling tiles; insulation; wet or soaked wall board. May require asbestos contractor. Perform carpet extraction and area cleaning steps.Completion: OPP or Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Category I, II. Pre-Assess Asbestos/HBM’s. Stop leak/ source. Assess impact as feasible. Anticipate external response support. Conduct joint walkthrough with OPP/CWS, Campus Maintenance/3rd Party Manager, and/or (ABS, ARL), Restoration Contractor, 3rd Party Consultant and EHS, as feasible. Define scope/action plan in coordination with Location. May require other management(s) support.Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Consult Risk Management ASAP. | Category III - Anticipate potential mold growth. Anticipate large scale funding.  |
| **Condensation** (high space humidity, poor air exchange,failed insulation, etc.) | Contact WRD or Campus reporting line; pre-assess asbestos/HBM’s. Conduct initial steps; dispatch Tech Service/evaluate source. Consult EHS or OPP Eng. Services for assistance. Replace, repair or install insulation. Initiate HVAC or related repair. Replace CT.Completion: OPP or Campus/contractor verification. | Refer to Category I. Pre-assess asbestos & HBM’s.Surface clean using QuatStat or Virex to remove surface mold growth. Completion: OPP or Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Categories I and II. Anticipate both surface mold at diffusers, in space, AND mold growth within HVAC fan and coil compartments. Anticipate need for joint walkthrough with OPP/Work Unit, EHS and mechanical contractor/ possible mold abatement support. Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Consult or notify Risk Management ASAP. | Anticipate required HVAC or related equipment shutdowns, and possible need for immediate space dehumidification. |

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| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 100 gallons)** | **Category II – Moderate Impact (Estimated 100 gallons – 2,000 gallons)** | **Category III – Significant Impact (Estimated to exceed 2,000 gallons)** | **OTHER NOTES** |
| **Closed-Loop Heating/Cooling (CLHC) or Treated Water Systems** | Contact WRD or Campus reporting line; pre-assess asbestos and HBM’s. Conductinitial steps/ assess scope. CLHC water requires special disposal considerations due to chemical additives. Collect CLHC or treated water, consult EHS and pertinent WWTP authority prior to discharge to sanitary sewer drains. CLHC water must NOT be discharged to stormwater drains. CLHC water may pose slip/trip/fall hazard. Soap and water cleaning may be required with appropriate PPE. Refer to Safety Data Sheet. Contact Safety Officer and EHS for assistance. Completion: OPP or Campus/contractor visual verification. | Refer to Category I. Pre-assess asbestos and HBM’s. Complete initial steps. Anticipate support by Utility Services or pertinent external contractor(s) for large volume impact.Completion: OPP or Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Categories I and II.Anticipate need for joint walkthrough, external support, and shut-down/isolation of work operations during clean-up.Refer to other OPP requirements for Temporary Work Area Isolation. Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Consult or notify Risk Management ASAP. | If a large quantity of treated water is planned for or discharged to sanitary drains, contact the applicable Waste Water Treatment Plant for directions. Stop/contain discharge to prevent discharge to stormwater drains. Contact Engineering Services/Utility Systems for support. Campuses follow spill control plan contacts for assistance.  |

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| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 100 gallons)** | **Category II – Moderate Impact (Estimated 100 gallons – 2,000 gallons)** | **Category III – Significant Impact (Estimated to exceed 2,000 gallons)** | **OTHER NOTES** |
| **Roof Leaks/****Rainwater** | Contact WRD or Campus reporting line; pre-assess asbestos and HBM’s. Conduct initial steps/ assess scope. Consult OPP Maintenance Programs/ Roofing for support. Identify source and repair as soon as possible. Refer to other applicable Category I response items, including any needed asbestos assessment. Consult EHS for assistance.Completion: OPP and Campus/Contractor visual verification. | Refer to Category I. Pre-assess asbestos and HBM’s. Patching/redirecting of incoming water required to minimize further damage. Conduct cleaning steps or use external contractor support. Monitor to determine if problem is escalating. Roof leaks (gray water) may contain higher microbial concentration, and may impact broader scope, necessitating external contractor support. Relocation of occupants may be necessary. Completion: OPP and Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Categories I, II. Major rainwater infiltration likely result of large-scale roofing failure. Evaluate and repair/replace roofing as soon as feasible. Consult EHS and OPP Roofing or Commonwealth Services to determine pertinent work planning, and any necessary occupant isolation or re-location and needed management.Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Consult or notify Risk Management ASAP. | Anticipate extended monitoring and management of problem conditions. |

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| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 100 gallons)** | **Category II – Moderate Impact (Estimated 100 gallons – 2,000 gallons)** | **Category III – Significant Impact (Estimated to exceed 2,000 gallons)** | **OTHER NOTES** |
| **Groundwater** | Contact WRD or Campus reporting line; pre-assess asbestos and HBM’s. Conduct initial steps/ assess scope. Consult OPP Engineering Services/ Buildings Engineer and Utility Systems for support. Initiate coordinated action to identify potential sources. Refer to other applicable Category I response items. Consult EHS for assistance.Completion: OPP or Campus/contractor visual verification. | Refer to Category I. Pre-assess asbestos and HBM’s. Engage OPP Engineering Services and Utility Systems for support.Conduct cleaning steps or use external contractor(s) for support. Maintain proper occupancy conditions as prior noted. May require excavation, regrading or other subgrade corrective actions. Completion: OPP or Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Categories I and II.OPP and/or Work Unit consult EHS to verify safe occupancy conditions and jointly plan to manage interim conditions until corrective action can be completed.Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Consult or notify Risk Management ASAP. | Anticipate extended monitoring of problem conditions and routine or periodic maintenance.Refer to PS Confined Space Program for elevator pits, etc. |

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| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 5 gallons)** | **Category II – Moderate Impact (Estimated up to 25 gallons)** | **Category III – Significant Impact (Estimated to exceed 25 gallons)** | **OTHER NOTES** |
| **SEWAGE** | Contact WRD or Campus reporting line; pre-assess asbestos and HBM’s. Conduct initial steps/ assess scope. Consult OPP or applicable Wastewater Treatment Plant (WWTP) and EHS for support. May require external support. Isolate and restore (no occupant entry until restored). Refer to other applicable Category I response items. Completion: OPP/contractor visual verification. | Refer to Category I.Pre-assess asbestos and HBM’s. Anticipate external contractor support.Consult EHS for assistance and to verify protection of occupants. Completion: OPP or Campus/contractor visual verification. Consult EHS for clarification. Consult or notify Risk Management ASAP. | Refer to Categories I and II.Contact WWTP for vacuum truck to remove bulk amount of sewage.Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. Declaration requirements dependent upon impact. Consult or notify Risk Management and EHS for assistance ASAP. |  |

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| **Source Water Type** | **Category I –** **Minor Impact (Estimated up to 100 gallons)** | **Category II – Moderate Impact (Estimated 100 gallons – 2,000 gallons)** | **Category III – Significant Impact (Estimated to exceed 2,000 gallons)** | **OTHER NOTES** |
| **Hidden, or Unknown Source(s)** | Contact WRD or Campus reporting line; conductinitial steps/ assess scope. Assess HBM’s.Conduct coordinated assessment with pertinent stakeholders (refer to section 7.4). Parties to report periodic progress or status to OPP Work Planning, Commonwealth Services or Campus coordinator, to EHS, and to affected Work Unit. Maintain occupant safety and health during assessment/corrective actions.Completion: OPP/contractor visual verification | Respond according to current needs.Completion: OPP/contractor visual verification. Consult EHS for clarification. | Respond according to current needs.Completion based on 3rd party, OPP and/or Campus verification of contractor work scope. | Anticipate extended monitoring of problem conditions and routine or periodic maintenance. |

**9.0 General Considerations**

**9.1 Standard Procedural Guides**

 The following general considerations should be taken when dealing with water incursion events:

9.1.1 Wherever electrical hazards may be involved in water incursion events, contact Penn State OPP or Campus Electricians for assistance. Clean-up activities should not begin until all electrical fixtures and other equipment are properly de-energized.

9.1.2 Every effort should be made to identify and correct the source of the water incursion before any significant clean-up efforts are conducted.

9.1.3 Prompt action is required to minimize the potential for mold growth. If clean-up efforts are initiated within 24-48 hours after water incursion occurs, the potential for mold growth is greatly reduced. After 56 hours, mold growth is extremely likely and more extensive cleaning and decontamination will be required.

9.1.4 Standing water on the floor should be mopped up or wet-vacuumed before any cleaning begins.

9.1.5 Wet carpeting should be extracted using a commercial carpet extraction machine, followed by use of floor discharge fans and dehumidifiers to speed up the drying process.

9.1.6 Deodorizing chemicals should NOT be used to mask potential musty odors caused by mold growth. These chemicals make identifying mold contamination in areas more difficult.

9.1.7 Water incursion within ventilation ductwork requires prompt attention. This is particularly important with interior-lined ductwork, where external contractor support may be required. Liner must be extracted and dried as quickly as possible. The affected section of ductwork should be isolated from the remaining ventilation system before cleaning begins.

9.1.8 When water incursion or flooding occurs on the upper floors of a building, special consideration must be given to the effect on the floor(s) below. Water within walls, wet insulation and potential electrical issues may exist. A moisture test meter can be used to identify problem areas; drywall sections may need to be removed to adequately dry these areas.

9.1.9 **Wet or moldy insulation or porous building materials should be removed and replaced.** **CAUTION: If material is suspect asbestos-containing material, do not disturb. Contact EHS for assistance.**

9.1.10 All water incursion incidents that involve sewage, regardless of the extent of damage, will require a thorough cleaning of all affected surfaces using properly mixed and applied Virex 64 or Betco Quatstat.

9.1.11 Indoor relative humidity levels should be maintained less than 65% to prevent mold growth. Dehumidifiers can assist in removing excess moisture from the air.

9.1.12 Furnishings should NOT be placed back onto the carpet until it is completely dried. Floor discharge fans and dehumidifiers can be used to speed up this process.

9.1.13 Resilient flooring (i.e., vinyl composition tile, linoleum, terrazzo) should be mopped or wet-vacuumed to remove standing water. **CAUTION: If tiles come up from the floor, assume that they contain asbestos, do not disturb and contact OPP, Campus, or EHS for assistance.**

9.1.14 Any ceiling tile that has water stains should be removed and replaced.

9.1.15 A limited quantity of ceiling tiles that show evidence of mold growth may be carefully removed, placed in plastic bags, sealed, and discarded as typical waste, then replaced. No special disposal procedures are necessary for stained or moldy ceiling tiles.

9.1.15 OPP Service and Campus Maintenance must be aware that certain University buildings, areas and populations may require higher levels of cleaning (the use of bleach and/or other disinfectants, post-cleaning testing, etc.) than those listed here (i.e., health care areas such as University Health Services clinical areas, child-care facilities, the General Clinical Research Center [GCRC] at Noll Lab, clean rooms, etc.).

**9.2 Other Procedural Guides by Level of Impact**

9.2.1 Moderate Impact Areas

 Carpet removal should be anticipated depending on the presence of padding, black water, and the duration carpet has been soaked or wet. Carpet that has NOT been extracted and dried within 56 hours should be anticipated to require removal.

9.2.2 Significant Impact Areas

 Work in significant impact areas are anticipated to require expertise beyond the ability of OPP or Campus Maintenance staffs to properly and adequately remove damaged materials, extract/clean, dry, and dehumidify contents. In such cases, qualified external contractors with expertise in water restoration or sewage clean-up, shall be used.

 Qualified external contractors are listed under the Penn State JOC.

 Contact the OPP Work Reception Center for listed contractors (5-4731). Conduct all other required notifications. Contact EHS for additional questions or assistance.

* Drywall Removal – Removal and replacement of water-damaged drywall will be required in all Significant Impact Areas.
* Occupant Entry – Occupants should refrain from entering Moderate and Significant Impact Areas, also including sewage or black-water contaminated areas until cleaning is completed.

9.2.5 Mold Growth

* A remote visualization system can be used to look behind walls for potential mold contamination. If mold behind walls is suspected, contact OPP and/or EHS for assistance.
* If extensive mold growth is found (> 30 square feet), special work practices, similar to those used for asbestos abatement may be needed (area containment, negative pressure with HEPA filtration of air, wet methods for cleaning and/or wet cleaning with disinfectants, and HEPA vacuum cleaning). Such practices are beyond in-house capabilities of Penn State and should be anticipated to require an external contractor who specializes in mold remediation services.
* Significant quantities of ceiling tiles with mold growth should be removed by an external contractor.
* All furnishings in a mold remediation work zone should be wiped down with a soap and water/ disinfectant solution. Electronic equipment should be allowed to thoroughly air dry before returning it to use.

**10.0 Incident Notifications**

**10.1 General**

When any water incursion is discovered, the OPP Work Reception Desk, or the Campus Maintenance Office and/or Police Services (off-hours) should be contacted. Additionally, the Facility Coordinator/ Safety Officer, Housing and Foods Building Manager (University Park), or 3rd Party Property Manager must be notified.

**10.2 Penn State Risk Management**

The University Risk Management Office should be contacted and advised of Moderate or Significant Impact water incursion events within 24 hours or as soon as feasible.

**10.3 Penn State EHS**

Penn State EHS should be contacted for support during Moderate and Significant Impact water incursion events, also including any sewage leaks in occupied areas, and in areas where clean-up may be particularly difficult, as soon as feasible.

Penn State EHS can provide guidance and recommendations on remedial actions needed to minimize the effects of water incursion.

**11.0 Training Requirements – RESERVED**

 **11.1 General**

 Response personnel are required to conduct necessary tasks and activities, depending on the required level and conditions of response. All such personnel must be minimally trained to conduct proper response, and where applicable, possess necessary certifications or licensure required by federal, state, or local regulation.

Training requirements will be further defined during future WIRP revision.

**12.0 Record Retention & Review – RESERVED**

**12.1 General**

As part of periodic review, closure of water incursion incidents should be evaluated to verify such elements as: timeliness of response, availability of needed resources, successful coordination and communications, and relative costs associated with efficient completion of response actions.

Record Retention & Review will be developed during future WIRP revision.

**13.0 Water Incursion Response Plan – Inspection & Auditing – RESERVED**

**13.1 General**

This *Water Incursion Response Plan & Standard Operating Procedures* requires varied assessment or inspection activities integral to closure or proper management of a water incursion incident.

Overall WIRP inspection and auditing may be developed during future WIRP revision.

**14.0 Supporting Information**

 **13.1 Penn State Resource Information and other Guidance Documents**

13.1.1 Penn State Stormwater Publications and Training Documents

 <https://opp.psu.edu/penn-state-stormwater-publications-and-training-documents>

* Illicit Discharges
* Tracking Illicit Discharges
* Spill Control

13.1.2 Penn State EHS website (reserved for reference)

13.1.3 “A Brief Guide to Mold, Moisture and Your Home”, U.S. Environmental Protection Agency”, 2002.

13.1.4 “Guidelines on Assessment and Remediation of Fungi in Indoor Environments”, New York City Department of Health and Mental Hygiene, 2002.

13.1.5 “Water Incursion Check List Procedures”, The Milton S. Hershey Medical Center, College of Medicine, 2001.

13.1.6 “Moisture Control Guidance for Building Design, Construction and Maintenance” (EPA 402-F-13053), 2013. <http://www.epa.gov/iaq/pdfs/moisture-control.pdf>

**13.2 Resource Organizations**

13.2.1 Carpet and Rug Institute – Carpet maintenance and restoration guides

 [www.carpet-rug.org](http://www.carpet-rug.org)

13.2.2 International Institute of Cleaning and Restoration Certification (IICRC) – Information, standards for inspection, cleaning, restoration of materials; certification courses.

 [www.iicrc.org](http://www.iicrc.org)

 <http://www.iicrc.org/education-certification/course-schedule/>

13.2.3 National Institute of Building Sciences (NIBS) –

 Building science, regulation support, technology guidance

 [www.nibs.org](http://www.nibs.org) 202-289-7800

13.2.4 National Air Duct Cleaners Association (NADCA) –

 Duct cleaning information, standards, guidance;

 [www.nadca.org](http://www.nadca.org) 202-737-2926